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Buyer's Guide: 70 Graphics Programs

February 1988

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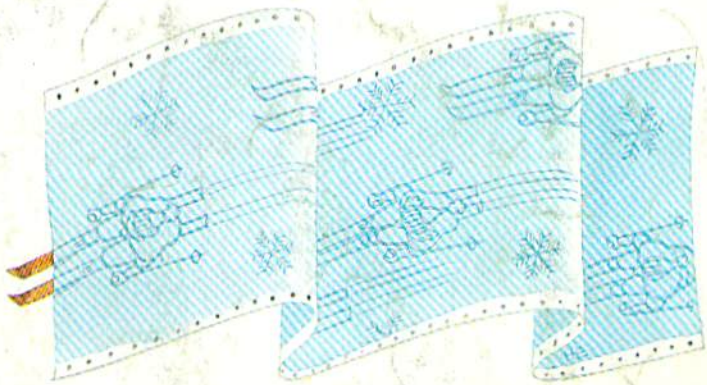
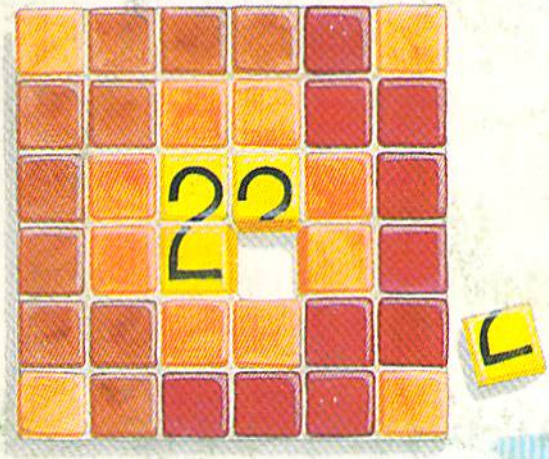
How readers solve problems and make money with Commodore 64 and 128 graphics software.



Grand Pix

Turn your hi-res art into a giant poster. For the 64.



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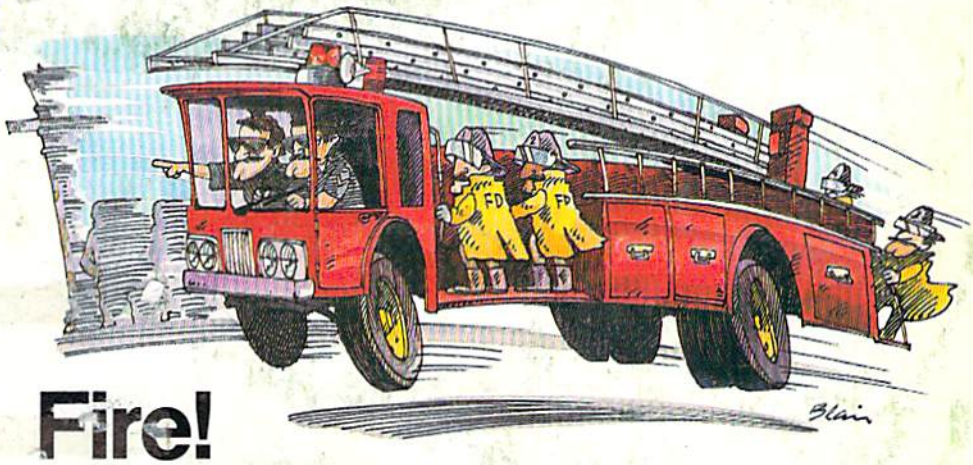
Power BASIC: Impossible Borders

Reviews: New Hardware And Software

Mosaic

Who's smarter—man or machine? There's only one way to find out. A one- or two-player strategy game for the 64.



Fire!

Sharpen math skills and have fun at the same time with this educational game for the 64.

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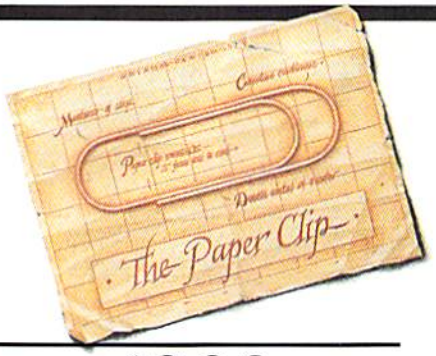
T · H · E EVOLUTION OF THE PAPER CLIP

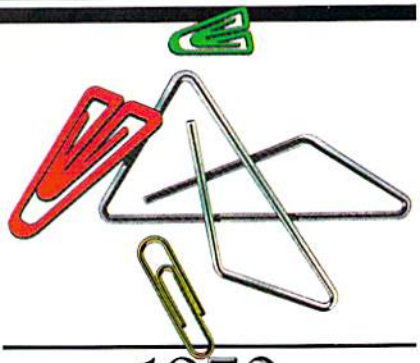


1900

Norwegian inventor, Johann Waaler, patents the paper clip in Germany. The metallic device allows one to attach sheets of paper together.

1950

By virtue of its sheer, simple power, Waaler's paper clip endures to become an indispensable item for both the home and office.



1970

While computers diminish paper flow, new-fangled variations of Waaler's paper clip emerge in an array of sizes, shapes and colors. Evolutionary note: When man can no longer invent, he must improve.

1982

Batteries Included invents a powerful word processing program for Commodore® users—PaperClip®. Compatible with virtually every popular printer, PaperClip provides users with fast, flexible editing and formatting freedom.

1986

PaperClip II becomes the #1 best selling C128® word processing program. Added editing and formatting features include word-wrap and an 80-column screen mode. Built-in telecommunications and a spelling checker make the second generation a supreme package. Omni Magazine calls PaperClip II "the Cadillac of word processors."

1987

Once again, Batteries Included outdoes itself—and the competition. Presenting more formatting commands than ever before, PaperClip III lets users select multiple line headers/footers, as well as outline formats. Pop-up menus provide easier access to a host of improved functions and printing options. The best keeps getting better . . .

1988

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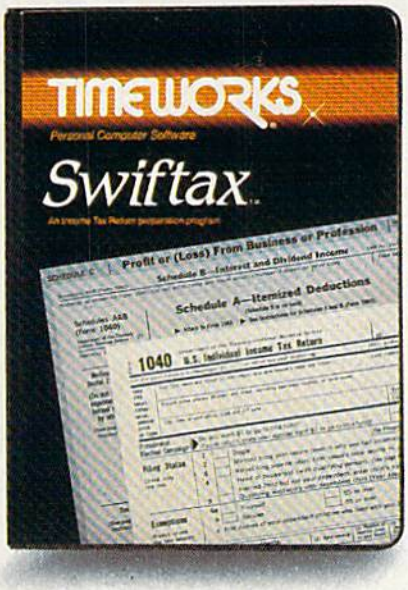

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STOCKS PLUMMET IN RECORD TRADING

Television Highlights

Weather

ED'S WEEKLY

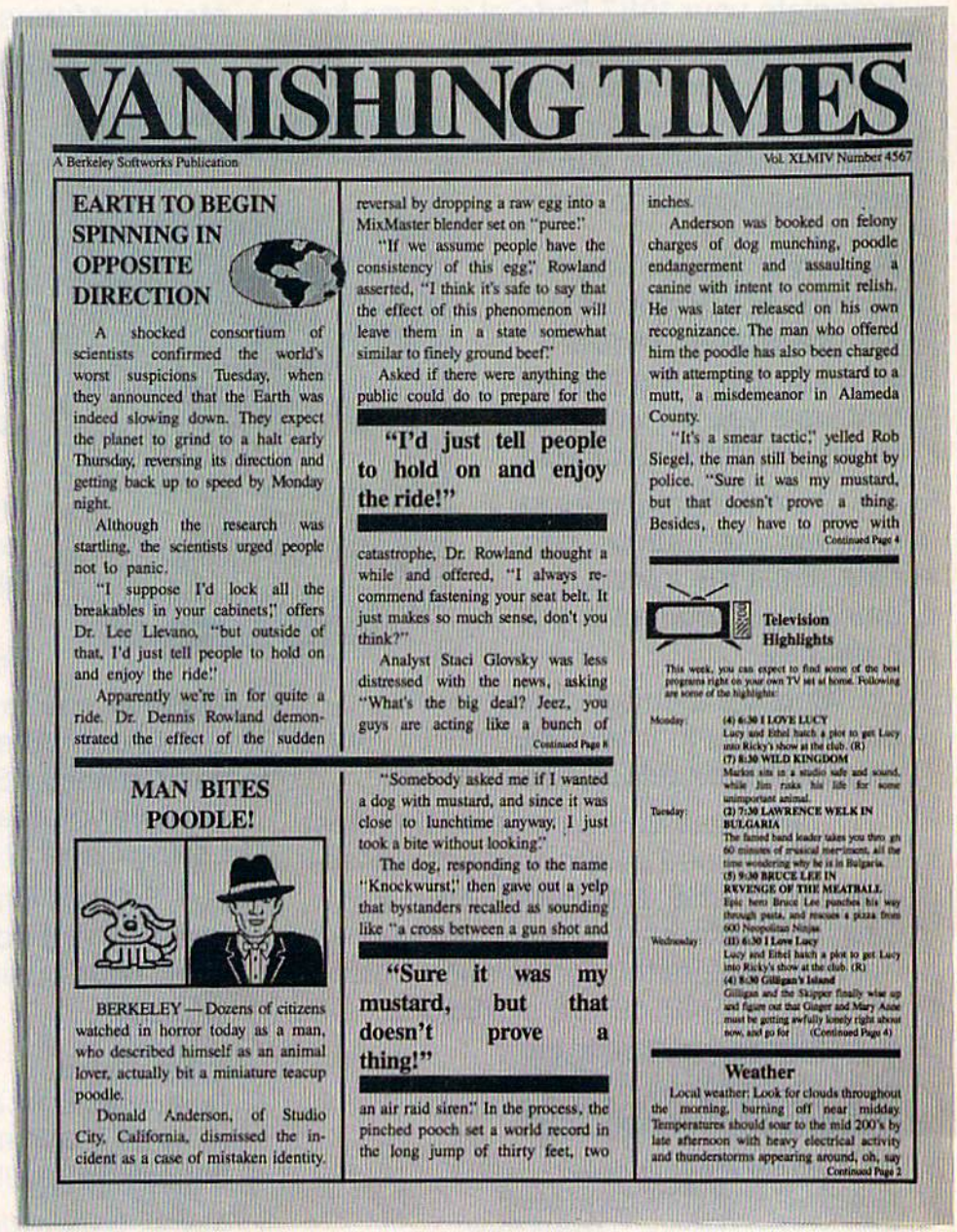
The views and news of Ed.

December 3

Basquing In The Beauty of Andorra

Weather

More people reading stuff like this!



VANISHING TIMES

A Berkeley Softworks Publication

Vol. XLMIV Number 4567

EARTH TO BEGIN SPINNING IN OPPOSITE DIRECTION

A shocked consortium of scientists confirmed the world's worst suspicions Tuesday, when they announced that the Earth was indeed slowing down. They expect the planet to grind to a halt early Thursday, reversing its direction and getting back up to speed by Monday night.

Although the research was startling, the scientists urged people not to panic.

"I suppose I'd lock all the breakables in your cabinets," offers Dr. Lee Llevano, "but outside of that, I'd just tell people to hold on and enjoy the ride!"

Apparently we're in for quite a ride. Dr. Dennis Rowland demonstrated the effect of the sudden reversal by dropping a raw egg into a MixMaster blender set on "puree."

"If we assume people have the consistency of this egg," Rowland asserted, "I think it's safe to say that the effect of this phenomenon will leave them in a state somewhat similar to finely ground beef."

Asked if there were anything the public could do to prepare for the catastrophe, Dr. Rowland thought a while and offered, "I always recommend fastening your seat belt. It just makes so much sense, don't you think?"

"I'd just tell people to hold on and enjoy the ride!"

Analyst Staci Glovsky was less distressed with the news, asking "What's the big deal? Jeez, you guys are acting like a bunch of

Continued Page 8

MAN BITES POODLE!

BERKELEY — Dozens of citizens watched in horror today as a man, who described himself as an animal lover, actually bit a miniature teacup poodle.

Donald Anderson, of Studio City, California, dismissed the incident as a case of mistaken identity. "Somebody asked me if I wanted a dog with mustard, and since it was close to lunchtime anyway, I just took a bite without looking."

The dog, responding to the name "Knockwurst," then gave out a yelp that bystanders recalled as sounding like "a cross between a gun shot and an air raid siren." In the process, the pinched pooch set a world record in the long jump of thirty feet, two inches.

"Sure it was my mustard, but that doesn't prove a thing!"

Anderson was booked on felony charges of dog munching, poodle endangerment and assaulting a canine with intent to commit relish. He was later released on his own recognizance. The man who offered him the poodle has also been charged with attempting to apply mustard to a mutt, a misdemeanor in Alameda County.

"It's a smear tactic!" yelled Rob Siegel, the man still being sought by police. "Sure it was my mustard, but that doesn't prove a thing. Besides, they have to prove with

Continued Page 4

Television Highlights

This week, you can expect to find some of the best programs right on your own TV set at home. Following are some of the highlights:

Monday:
(4) 6:30 I LOVE LUCY
Lucy and Ethel hatch a plot to get Lucy into Ricky's show at the club. (R)
(7) 8:30 WILD KINGDOM
Marlon sits in a studio safe and sound, while Jim risks his life for some unimportant animal.

Tuesday:
(2) 7:30 LAWRENCE WELK IN BULGARIA
The famed band leader takes you thro gh 60 minutes of musical merriment, all the time wondering why he is in Bulgaria.
(5) 9:30 BRUCE LEE IN REVENGE OF THE MEATBALL
Epic hero Bruce Lee punches his way through pasta, and rescues a pizza from 600 Neopolitan Ninjas.

Wednesday:
(11) 6:30 I Love Lucy
Lucy and Ethel hatch a plot to get Lucy into Ricky's show at the club. (R)
(4) 8:30 Gilligan's Island
Gilligan and the Skipper finally wise up and figure out that Ginger and Mary Anne must be getting awfully lonely right about now, and go for

(Continued Page 4)

Weather

Local weather: Look for clouds throughout the morning, burning off near midday. Temperatures should soar to the mid 200's by late afternoon with heavy electrical activity and thunderstorms appearing around, oh, say

Continued Page 2

Text can be printed in every font available through GEOS. These documents were printed on an Apple Laser Writer

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These days, the biggest story in the news is geoPublish. The page-making program for GEOS-equipped 64's and 128's that replaces lifeless layouts with page after page of powerful, punchy professionalism.

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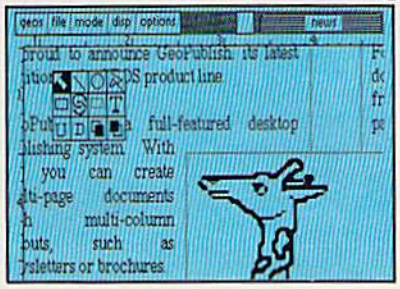
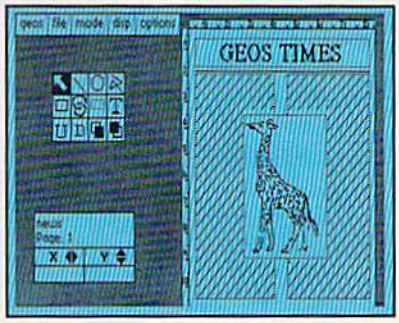


Everything fills up automatically until it fits firmly into your finely fashioned format.

Extras! Extras! Read all about 'em!



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editor's notes

After an association of eight years, and after a year as Editorial Director, I'm leaving COMPUTE! Publications to form a new company with Robert Lock, COMPUTE!'s founder.

Withdrawing, I can see the pathways that led to COMPUTE!'s current status as a leader in consumer-oriented computer publications. I can also see the exciting growth and strength of our publications, how they matured under Robert's guidance.

These pathways, the growth and strength, were only aspirations back in 1980 when I wrote some articles and sent them to COMPUTE!. The magazine had a few thousand readers then and was competing with a handful of other consumer publications for the new home computing audience.

The following year, Robert asked me if I would be interested in joining his fledgling staff as an editor. I came to Greensboro and worked with him and the half-dozen other COMPUTE! employees. Over the next six years, he built COMPUTE! into the significant publishing group it is today: more than 200 books in print, six separate magazines, and over one million readers a month.

We are grateful for the continued support of our readers, and agree with you that computing is too important an issue to be left to the experts. In the coming years, COMPUTE! Publications will continue to evolve, but it will never lose sight of its goal: to explore and explain these fascinating machines for the average intelligent person. In a democracy, of course, the people make the decisions. We believe that few forces in contemporary life are more significant—or will have greater long-term effects—than the impact of computers on society. So it is vital that the public understand this technology and, thereby, bring its collective wisdom to decisions about computing and public policy.

COMPUTE!, of course, also entertains. We have always offered games, graphics, music, and other programs of wide appeal. But, in addition, we feature serious applications, educational programs, tutorials, and even philosophical speculations. These traditions will continue.

Over the years COMPUTE! has attracted some of the most intelligent and talented writers, editors, programmers, and artists in the business. The magazines are now in their capable hands. I'm sure you'll find much to enjoy and much to learn in these pages over the coming years.

Richard Mansfield

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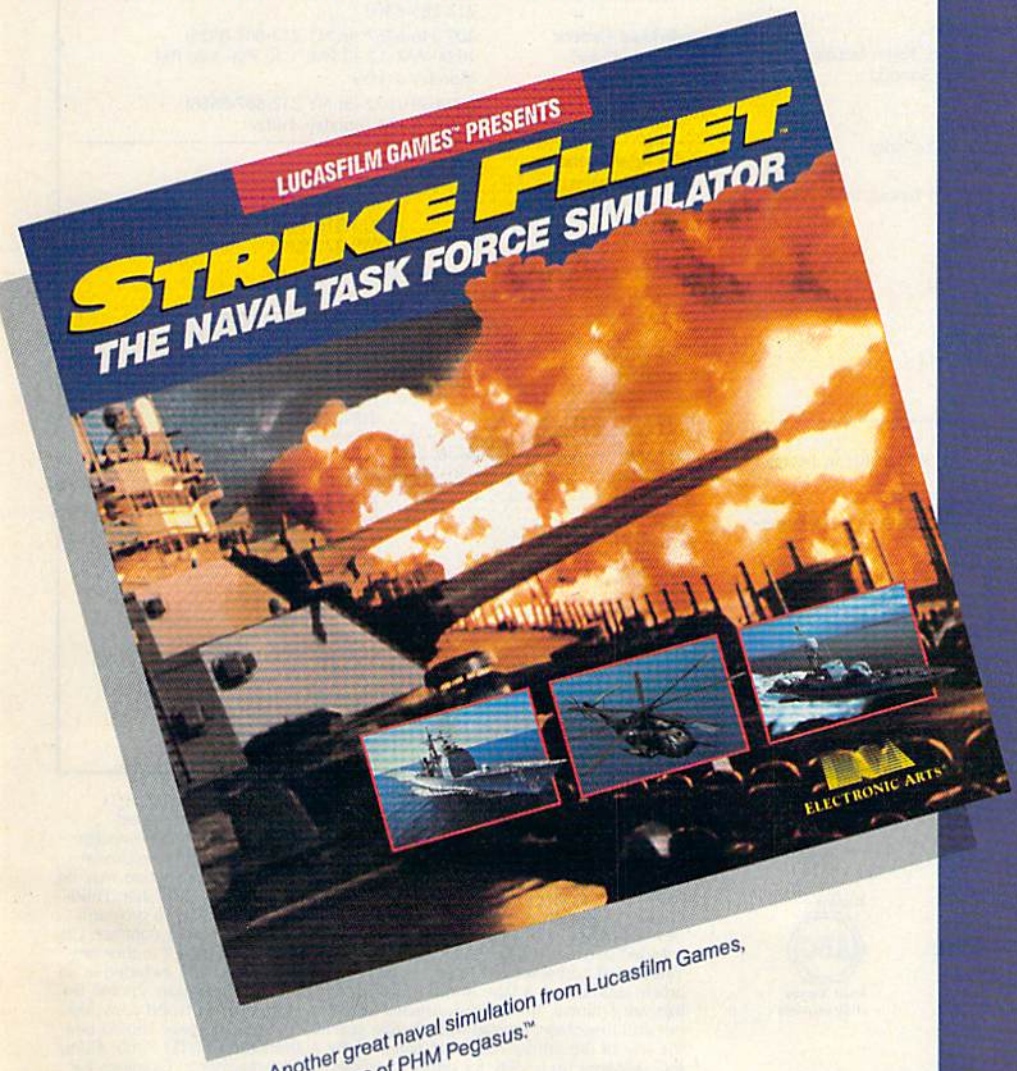

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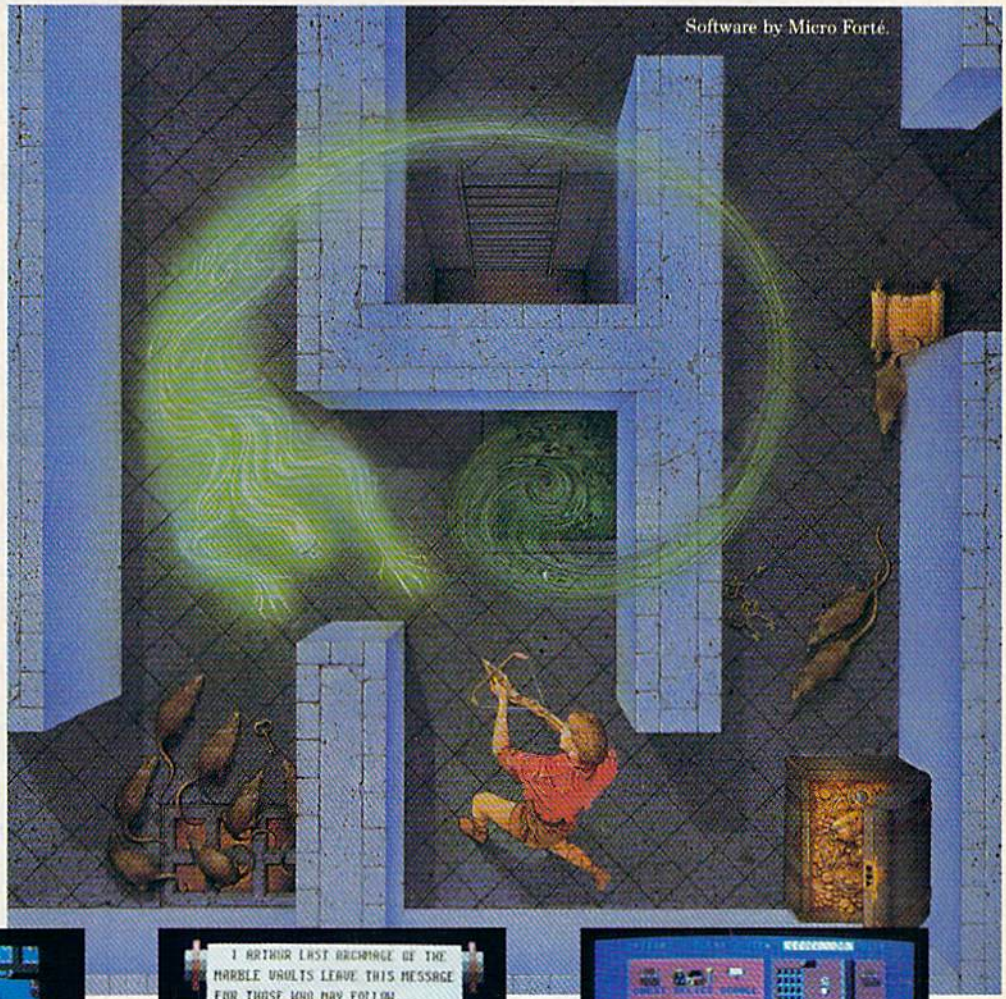

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Do you have a question or a problem? Have you discovered something that could help other Commodore users? We want to hear from you. Write to Gazette Feedback, COMPUTE!'s Gazette, P.O. Box 5406, Greensboro, NC 27403. We regret that, due to the volume of mail received, we cannot respond individually to programming questions.

Sacrificing Readability

After understanding READ and DATA, I wrote a program for the 64 that starts like this:

```
10 READ QUESTION$: READ
   ANSWER$
20 PRINT QUESTION$: INPUT A$
30 IF A$ = ANSWER$ THEN PRINT
   "CORRECT"
```

It always gives me an error message. I don't understand what's wrong with it.

Julio de la Mora

Some programmers like to use long variable names such as QUESTION$ or ANSWER$ because it makes the program more readable. When you use real words for variables, you can easily remember their functions in the program. You should be aware that the 64 and 128 recognize only the first two letters of a variable name. Try typing **QUEST=15: PRINT QUICK, QUAIL, QU**. *Notice that all of the variables are treated as a single variable, QU.*

Whenever you put long variable names in a program, you must watch for embedded keywords. The problem with QUESTION$ is that it contains the keyword ON, which is used in ON-GOTO branches. When line 10 is entered into memory, the two letters ON *are tokenized. The 64 thinks you're trying to use the ON command. Change the variable name to QUESTIO$ or QUESTIN$ and the error message will disappear.*

In addition to prohibiting embedded keywords, the 64 won't allow you to assign values to the reserved variables ST, TI, and TI$ (128 owners should add DS, DS$, ER, ERR$, and EL to the list). You're not permitted to say **ST=-15**, *for example. You'll note that the variable QUESTION$ contains both ST and TI, but that's fine. Unlike keywords, reserved variable names can be embedded anywhere except the first two characters.*

Overprotection And A New Computer

I have two questions. First, I have a 64 with a 1541 disk drive. My drive will load all programs except those by Electronic Arts. Do you know what the problem could be?

Secondly, I saw a Commodore 128D at a computer store. What are the differences between the 128 and the 128D?

Steve Zdancewic

Copy protection is the culprit in the case of your first question. Many companies protect their software, and game software has traditionally been the most heavily protected software of all. Unfortunately, some copy protection is so severe that only properly aligned disk drives can load the software. Many computer dealers can perform a drive alignment procedure that should solve your problem.

The Commodore 128D differs from the 128 in several ways. First, it comes with a built-in 1571 disk drive and detachable keyboard (the computer looks very similar to an Amiga 1000). Second, bugs in the 128 and 1571 ROMs have been corrected. Third, the 80-column VDC chip now has access to 64K of video RAM, up from 16K in the 128. This allows for higher-resolution graphics with more colors. The 128D is otherwise completely compatible with the original 128.

The Value Of Nothing

I think I've found a new clock or something while experimenting with my 64. I isolated the address and built the following program around it:

```
10 PRINT "{CLR}"
20 PRINT "{HOME}{4 DOWN}{4
SPACES}{4 LEFT}";
30 PRINT PEEK(55296)
40 FOR I=1 TO 200:NEXT
50 GOTO 20
```

The value in the memory location is constantly changing. Please tell me what's going on here.

Tim Schreiber

Your mystery location, 55296 ($D800 in hexadecimal), is the first address in the area of the computer's memory that holds screen color information. Print a character in the upper left corner of the screen, then POKE a value between 0–15 into location 55296. You should see the character change color (unless the value you use is the same as that for the current color). But since the color remains constant, you may wonder why the color memory value appears to be unstable.

Since the Commodore 64 can produce just 16 different colors, only four bits are required to hold all possible color values for each screen position. (Four bits can represent binary values in the range 0000–1111, 0–15 decimal.) The designers of the 64 took advantage of this situation to save a few pennies: Screen color memory is in its own RAM chip, separate from the rest of the computer's memory. For the 1024 locations in the color memory area, the memory cells are only four bits wide instead of the usual eight. If all eight bits had been used, a RAM chip with twice the capacity would have been required, and half that capacity would have gone unused.

However, the microprocessor still reads all eight data lines when you PEEK the contents of a memory location, even when only four are actually connected. In the case of color memory, the lower four bits contain the true color value, but the value returned for the upper four bits is unpredictable. It will depend on how the microprocessor interprets whatever stray electrical signals are present on the higher four lines of the computer's data bus when the location is examined. That's why the location you asked about appears to change randomly.

Try changing line 30 of your program to read as follows:

```
30 PRINT PEEK(55296) AND 15
```

Now you should see an unchanging value. The AND 15 strips off the meaningless upper four bits of the byte value, showing that the lower four bits remain constant.

MLX Printouts

I have a question regarding the "MLX" machine language entry program published in GAZETTE. I want to know how to print out copies of the MLX programs as I have entered them. I tried using OPEN 4,4:CMD 4 before running MLX, but that didn't work. Please help.

John L. Hunter

Your attempt to use the CMD command failed because a number of other BASIC

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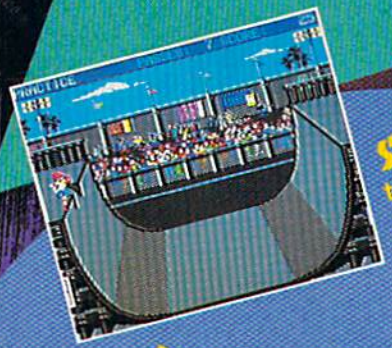

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statements cancel its effect, most notably GET—which appears frequently in MLX. The following additions and changes to the MLX program will add a printer option to MLX's Display command. Be sure to use the version appropriate for your computer:

For the Commodore 64:

```
612 PRINT"{DOWN}DISPLAY ON
    {RVS}S{OFF}CREEN OR {RVS}P
    {OFF}RINTER?"
614 GET D$:IF D$="" THEN 614
616 IF D$="P" THEN PRINT"{BLU}
    PRINTING...":OPEN 4,4:CMD 4
    :GOTO 630
618 IF D$<>"S" THEN GOSUB 1060
    :GOTO 614
650 F=1:AD=AD+8:IF AD<=EA THEN
     656
652 IF D$="P" THEN PRINT#4:CLO
    SE 4
654 PRINT"{BLU}** END OF DATA
    {SPACE}**":GOTO 220
656 IF D$="P" THEN 630
```

For the Commodore 128:

```
552 PRINT"{DOWN}DISPLAY ON
    {RVS}S{OFF}CREEN OR {RVS}P
    {OFF}RINTER?"
554 GETKEY D$:IF D$="P" THEN P
    RINT"{BLU}PRINTING...":OPEN
     4,4:CMD 4:GOTO 570
556 IF D$<>"S" THEN GOSUB 950:
    GOTO 554
600 F=1:AD=AD+8:IF AD<=EA THEN
     BEGIN:IF D$="S" THEN 610:E
    LSE 570:BEND
602 IF D$="P" THEN PRINT#4:CLO
    SE 4
604 PRINT"{BLU}** END OF DATA
    {SPACE}**":GOTO 220
```

The modifications also use CMD to redirect PRINT statements to the printer, but within a loop that contains no GETs. Note that a PRINT# must be issued before the CLOSE at the end of the loop to properly disconnect the CMD (line 652 in the 64 version or line 602 in the 128 version).

Sharing Data

I have read that there is something called a *null modem* which allows two computers to communicate without using phone lines. I am sure many Commodore owners would appreciate learning how to accomplish this. What equipment is needed? How does one connect the computers? I own a 64, 128, Plus/4 and two modems.

Julio Micheli

A null modem cable allows you to connect two computers without using phone lines. The transfer line from one computer's modem port is wired to the receive line on the other computer and vice versa, with the ground connected straight through. You then run terminal programs on both computers, uploading files from one and downloading on the other.

Most people who use null modem cables own two or more computers with incompatible disk formats. For example, the 64 uses 5¼-inch disks and the Amiga uses 3½-inch disks. If you owned these two computers, you could use a null modem cable to transfer text files from one computer to the other. You'd also need an RS-232 interface for the 64, to convert the voltage to the standard level.

In your case, you own three Commodore eight-bit computers that use the same kinds of disks. If you wanted to transfer a file from one computer to the other, it would be easiest to just save the file to disk and move the disk to the second computer. There's no need to use a null modem cable.

Saving A Character

I am writing an adventure game for the 64. I have worked out most of the bugs, but my problem is saving the characteristics of the adventurers. The player is asked to select values for his or her character such as intelligence, integrity, and strength, which are then preserved as string variables.

When the player decides to leave the game for awhile, he or she is given the option of saving the character. How can I save all this information as just one file?

David Carter

To save variables to disk, you open a file, write to it, and close it. Say you have ten characteristics stored in a string array CH$. The following lines open a sequential file and write your variables to disk:

```
GM 1000 OPEN 15,8,15:OPEN 8,8,
        8,"0:FILENAME,S,W"
MA 1010 FOR I=0 TO 9:PRINT#8,C
        H$(I):NEXT I
HR 1020 INPUT#15,EN,EM$:CLOSE8
        :CLOSE15:IF EN<>0 THEN
         PRINT EN;EM$:END
```

The following lines will read the file back:

```
HE 2000 OPEN 15,8,15:OPEN 8,8,
        8,"0:FILENAME,S,R"
PG 2010 FOR I=0 TO 9:INPUT#8,C
        H$(I):NEXT I
EB 2020 INPUT#15,EN,EM$:CLOSE8
        :CLOSE15:IF EN<>0 THEN
         PRINT EN;EM$:END
```

The End Of A File

How can I get the starting and ending address of a ML program? Also, I have a spreadsheet program that has the manual on disk and I'd like a program that will print out any sequential file.

G. Debaets

The two bytes at the beginning of BASIC and machine language programs always indicate the load address. To find the starting address, open the file and read in the low byte and the high byte. For the ending address, keep reading the file until there's nothing more to read. If you know how long the file is, you can add the value to the starting address to get the ending address. Here's a program that figures out the starting and ending address:

```
MJ 10 INPUT"NAME OF FILE";F$
PK 20 OPEN1,8,0,F$+",P,R"
FM 30 OPEN15,8,15:INPUT#15,E,E
      $:IFE<>0THENCLOSE1:CLOSE
      15:PRINTE$:END
CH 40 GET#1,L$:GET#1,H$:SA=ASC
      (H$+CHR$(0))*255+ASC(L$+
      CHR$(0)):EA=SA
QK 50 GET#1,A$:EA=EA+1:IFST<>6
      4THEN50
QF 60 CLOSE1:CLOSE15
AJ 70 PRINT"STARTING ADDRESS:"
      ,SA
QX 80 PRINT"ENDING ADDRESS:",E
      A
```

Line 50 continues to read bytes from the file until there are no more to read. The reserved variable ST returns the status of the last input/output operation. With disk files, ST will be 0 if there's more in the file and 64 if the end of the file has been reached.

To print out a text file (assuming it's stored in Commodore ASCII), open the file, read the characters, and print them to the screen. Again, the ST variable tells you where the end of the file is. Substitute the appropriate filename in line 10.

```
10 OPEN4,4,7: OPEN 1,8,2,"filename,S,R"
20 GET#1, A$: S=ST
30 PRINT#4, A$;: IF S=0 THEN 20
40 CLOSE 1: PRINT#4: CLOSE 4
```

It's necessary to copy ST to another variable because it is affected by I/O operations, including the PRINT# statement.

The Language of MLX

I've been wondering how to write machine language programs. I wish to be able to use the "MLX" machine language entry program you publish each month. I'm anxious to begin, so please give me a list of the MLX programming numbers along with definitions, or tell me how I can find out how to make machine language programs on my own.

Kevin Temple

"MLX" is designed for entering previously created machine language programs. It's not for writing programs from scratch, nor is it a tool for learning how to program in machine language. The numbers in an MLX listing are indeed the instructions and data that comprise a machine language program, but the ML program itself was created by other means, then listed in MLX format to make it easier for our readers to type in.

To learn more about machine language programming for your Commodore, you should consult the many introductory books on the subject. Machine Language for Beginners, *published by COMPUTE! Books, is one good choice to help you get started. Instead of MLX, the tool you need*

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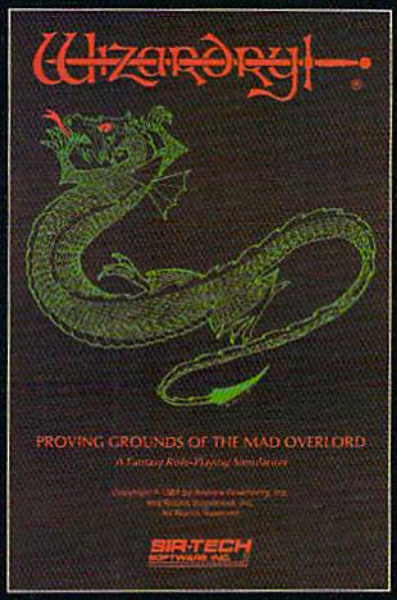

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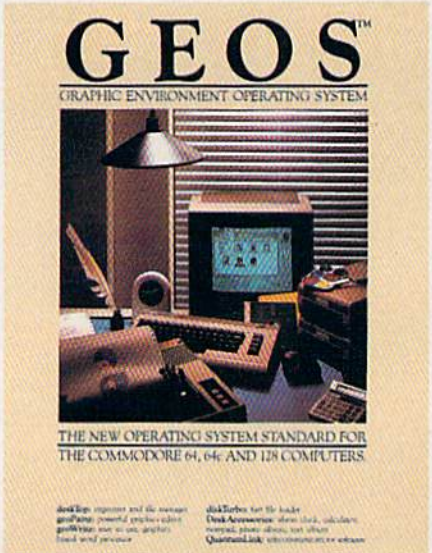
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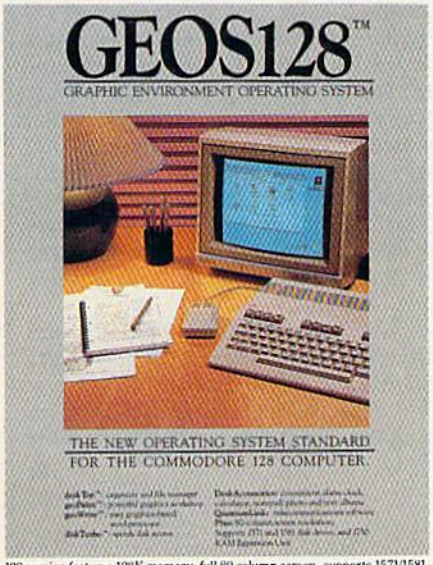

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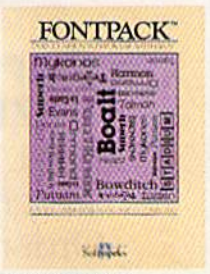

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to write machine language programs is an assembler. *Many different assembler programs are available; check the software ads in this issue. You might try asking any friends who are already machine language programmers which assemblers they prefer.*

Duplicate Numbers

A program I've written for my office on a 128 includes lots of information such as medication dosages, phone numbers, and so on. When I enter lines such as **300 data ER, 165, ICU, 200** and then LIST the program, it appears as **300 data valhex$, 165, right$lenelse, 200**. The computer is in upper-/lowercase mode, and the information is typed in all capital letters. In lowercase, the program lists properly. Is there a bug in my 128 or is it a problem I can correct with programming?

David M. Cline, M.D.

Everything in memory—BASIC programs, machine language programs, variables, and so on—is stored as numbers. The numbers representing the ASCII values for capital letters in one context are the same numbers that represent BASIC commands in another context. The conversion from ER to VALHEX$ isn't a bug in the 128; the computer is just misinterpreting the numbers it finds in memory.

A relatively quick fix, depending on how much data you've already typed, is to add quotation marks before and after the strings containing capital letters. This isn't necessary for numbers or lowercase words. Change your example line to this: ***300 data "ER",165,"ICU",200****. If you put the 128 into Auto-insert mode by pressing* Esc *followed by* A, *you can quickly add the additional quotation marks.*

Another solution would be to scrap the READ-DATA loop and store the data in a sequential file, which you could create with a word processor. Instead of reading from DATA statements, open the file and INPUT# or GET# the data from disk.

DOODLE! Files And The 128

In your November 1987 issue, "Gazette Feedback" included a program for loading *KoalaPad* pictures on the 128. I'd like to know if you could adapt the routine to load *DOODLE!* files in 128 mode.

James C. McGee, Jr.

The KoalaPad *loader had to perform some transformations to load the picture into the right memory locations in the 128. Hires screens saved in* DOODLE! *format have all the information in just the right places, which is quite convenient. To view a* DOODLE! *picture in 128 mode, use this line:* ***GRAPHIC1: BLOAD "picture", B0, P7168****. Substitute the* DOODLE! *filename for* picture *in the BLOAD statement.*

The Shadow Knows

While writing a machine language sprite driver on the 128, I ran into a problem. When I store values for the horizontal or vertical position of sprite 0 in locations 53248 and 53249, the sprite will flicker to the specified position, then move right back where it was before. I wrote a tiny ML program that continuously stored the position values, and the sprite stayed in the specified position until the program is stopped. Why do these locations not move the sprite as they do on the 64?

Also, could you please print a chart giving the address in ROM of the routine for each BASIC 7.0 command?

Brian Powell

The sprite circuitry in the 128's VIC chip is the same as that in the 64, so the phenomenon you experienced isn't the result of any hardware difference. Rather, your problem occurs because the 128 already has its own built-in machine language sprite driver routines to support BASIC 7.0's MOVSPR command. The VIC chip's sprite position registers—along with most of the SID chip registers—have shadows *in RAM. At regular intervals the computer automatically copies the contents of each shadow location into its corresponding hardware chip register. As a result, changing the hardware register directly has only a momentary effect because the value you store in the register will almost instantaneously be replaced by the value from the shadow location.*

In the 128, locations 4566–4582 ($11D6–$11E6) are shadows of the VIC chip's sprite position registers at 53248–53264 ($D000–$D010). Every 1/60 second the contents of the shadow locations are copied into the hardware registers as part of the BASIC portion of the IRQ interrupt service routine.

The 64's interrupt handler doesn't use shadow locations because BASIC 2.0 has no interrupt-driven statements. Interrupt-driven statements in BASIC 7.0 include MOVSPR to position sprites, as well as SOUND and PLAY for sound generation. When the MOVSPR statement is used to specify a moving sprite, the corresponding horizontal and vertical position values may be changed during the interrupt sequence according to values stored in the sprite movement data table at 4478–4565 ($117E–$11D5) before the shadow values are copied into the hardware registers.

There are two ways of dealing with the 128's interrupt sprite driver. The easiest is for your program to store sprite position values in the shadow locations and let the computer take care of placing the values in the hardware registers. Instead of storing values in locations 53248 and 53249 to position sprite 0, simply store the same values in locations 4566 and 4567. (Although BASIC numbers the eight sprites 1–8, most hardware references use 0–7.) You can use other shadow locations to animate the sprite. For example, if sprite 0 is defined and enabled, then the following instructions will set it moving diagonally from top to bottom and left to right—roughly the equivalent of the BASIC statement MOVSPR 1,120#15:

```
LDA  #$0F  ; set speed
STA  $117E
LDA  #$01  ; set direction
STA  $1180
LDA  #$6E  ; horizontal increment
STA  $1182
LDA  #$40  ; vertical increment
STA  $1184
```

Chapter 3 of Mapping the Commodore 128, *from COMPUTE! Books, has more detailed information on the shadow locations.*

The alternative is to disable the portion of the interrupt sequence that supports BASIC commands. This can be done by setting bit 0 of the value in location 2564 to 0 (POKE 2564,PEEK(2564) AND 254 in BASIC or LDA $2564:AND #$FE:STA $2564 in machine language). With this portion of the interrupt sequence disabled, you can store values directly in the 128's VIC chip registers just as you did for the 64. Just be sure that the 128 is set for the bank 15 configuration to gain access to the hardware registers. You should be aware that this approach has the side effect of disabling all the BASIC music commands as well as MOVSPR. Of course, if your program is written entirely in machine language this isn't a problem. In fact, it even provides a very slight speed increase.

BASIC 7.0 has almost 200 keywords and operators, so a chart of the all the entry addresses in ROM would be too long to print here. Refer to Appendix F in Mapping the Commodore 128 *for a complete list.*

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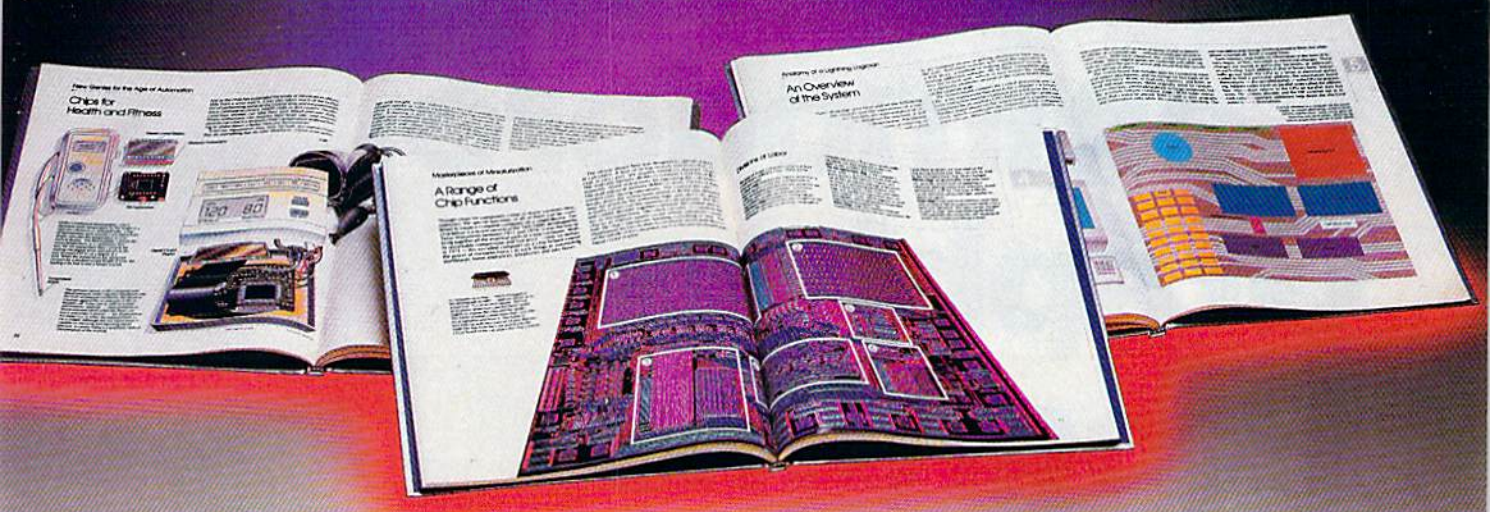

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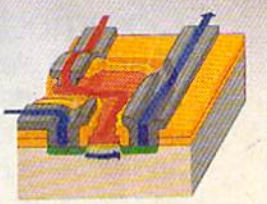

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A Buyer's Guide To

Commodore Graphics Programs

Caroline D. Hanlon and Mickey McLean

Commodore 64 and 128 graphics capabilities can be used to design a variety of printed pieces from greeting cards and certificates to models for mechanical toys. This buyer's guide lists many of the available graphics packages, and is divided into sections for paint, drawing, and utility programs, collections of clip art to add to other programs, and applications packages.

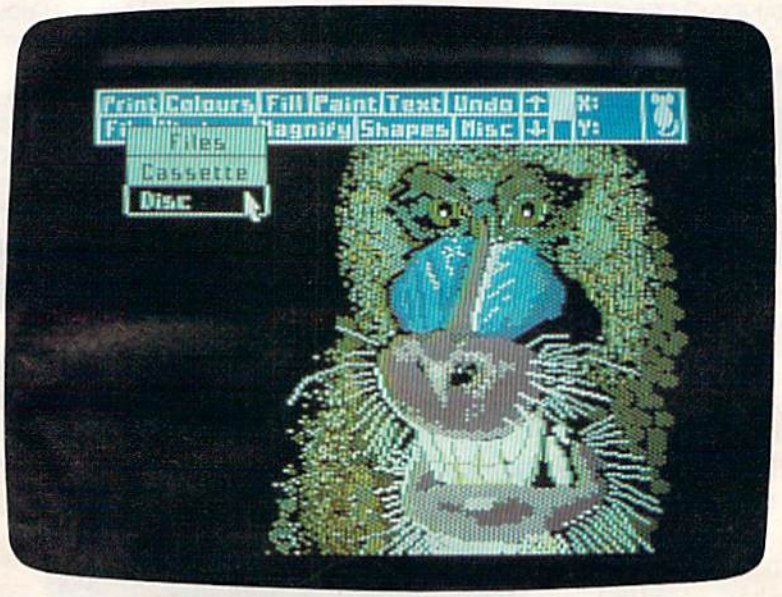
Paint Programs

Advanced OCP Art Studio
Firebird
joystick optional
$39.95

Color artwork can be created using this paint program for the Commodore 64. *The Advanced OCP Art Studio* runs in hi-res mode and offers 16 pens, 8 random strays, 16 brushes that can be defined by the user, three levels of magnification, and zoom. Windows can be inverted, cut and pasted, enlarged, reduced, stretched, flipped, and rotated. There is a font editor with nine character sizes. The program accepts input from the keyboard, Koala Pad, or Datex mouse, and the art can be saved and printed.

Blazing Paddles
Baudville
$29.95

Blazing Paddles is a paint program that can be used with several input devices. The program comes with a variety of text fonts and predrawn shapes, and includes a printer dump for most black-and-white and color printers. The user manual includes a short primer on hi-res graphics.



An artwork sample from Advanced OCP Art Studio.

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- Restart the program at any point
- No corruption
- An absolute must for the program Hacker – make changes and see your result's instantly!

- Compactor: Efficient compacting techniques – 3 programs per disk side – 6 programs if you use both sides.
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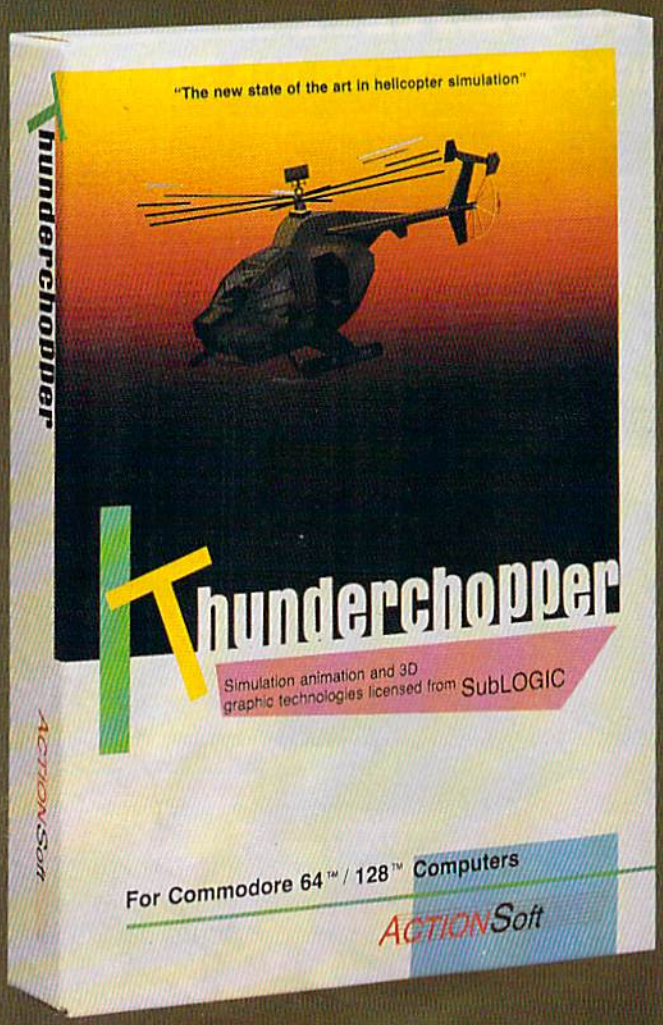
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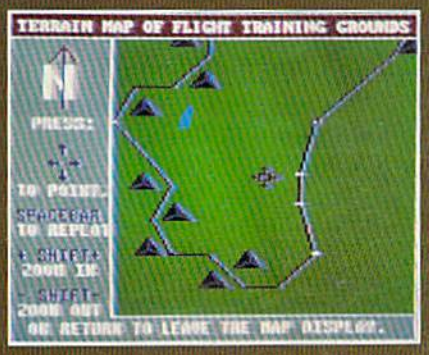

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GEOS
Berkeley Softworks
$59.95
This graphics operating system includes a word processor, *geoWrite*; a color graphics program, *geoPaint*; desk accessories such as an alarm clock, notepad, calculator, and photo album; and a desktop that manages files and displays them as icons or text.

GEOS 128
Berkeley Softworks
$69.95
GEOS 128 is an integrated package for the Commodore 128 that offers applications such as *geoPaint*, a graphics editing system, and *geoWrite*, a graphics-based word processor. Features include icons, pop-up menus, windows, and an 80-column hi-res screen. The diskTurbo speeds up disk access; and DeskTop, the graphics interface to *GEOS*, supports the 1571 and 1581 as double-sided drives and takes advantage of 1750 RAM expansion. With a modem the user can connect to online services or to a service that will laser print documents and return them in the mail. Desk accessories include a calculator, note pad, alarm clock, photo, and text albums.

The Graphics Magician Painter
Polarware Software
$24.95
This graphics program for the Commodore 64 uses color, patterns, lines, circles, fills, boxes, and brushes to help the artist create a variety of pictures. The program stores the artwork as artist's movements so the pictures can be edited at any time, and many can be stored on one disk at a time.

Poster
Scholastic
$29.95
Poster is a graphics language program designed to help students in grades 4–6 learn about programming while creating a poster. The program contains a set of background colors, brushstrokes, and brush colors. A list of commands allows students to make, save, load, store, or erase a poster from disk. While creating the poster, students control the size, speed, color, and direction of the paintbrush. An edit mode gives the student the chance to change his or her work of art.

Rainbow Painter
Springboard
$34.95
A graphics program for children ages 4–10, *Rainbow Painter* contains 50 different brushes and a variety of color patterns, so children can create their own drawings or color in one of the 50 prepared line drawings.

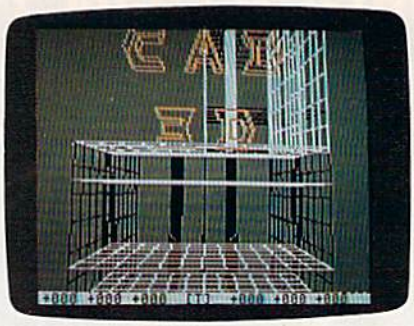
Drawing Programs

3-D Surface
Digiscape Software
1541 or 1571 disk drive
$39.95
The user can graph topographic maps, spatial frequency and distribution, subsurface geology, open pit mines, building sites, and logos, in three dimensions. The program is on disk and is menu-driven. Features include 3-D graphing routines with which the user may move the graph and change the elevation. Other adjustable parameters include grid size, printer output size, and center of graph. A dot-matrix printer is necessary if hardcopy of the graphics is desired.

Cadpak-64
Abacus Software
$39.95
This computer-aided design package can be used to create high-resolution pictures and graphics designs. Users can draw and edit pictures, drawings, or layouts. The program features dimensioning, zoom, color-fill, and printout capabilities.

Cadpak-128
Abacus Software
$59.95
This computer-aided design package for the Commodore 128 can be used to create high-resolution pictures and graphics designs. It offers the same features as the 64 version: drawing, editing, zoom, color-fill, and printout capabilities.

CAD 3D
IHT Software
$49.95
This three-dimensional computer-aided design program for the 64 can produce a wire-frame design using the Cartesian coordinate system.



CAD 3D *from IHT Software*

Up to 2000 lines can be drawn, rotated 360 degrees, translated to other axes, or superimposed over other designs. Text and graphics can be added using *DOODLE!*. The program accepts either keyboard or joystick input, and can output to the 1520 plotter or any Commodore-compatible dot-matrix printer that produces printouts in hi-res mode.

Chartpak-64 or -128
Abacus Software
$39.95
This drawing program can be used to design, draw, edit, and print pie, bar, and line charts or scatter graphs. It also calculates and inserts statistics such as the mean, regression, and least squares into the charts. The program is available in versions for the Commodore 64 or 128.

ColorMe: The Computer Coloring Kit
Mindscape
$29.95
Children in kindergarten through fifth grade can draw original pictures or color and cut-and-paste the pictures provided with this program. Text can be added to the pictures, and the pictures can be printed out. The package includes a teacher's manual, user's guide, and a *ColorMe Kids Picture* disk. A joystick is required. Additional picture disks are available for $9.95 each.

ColorMe: The Computer Coloring Kit *is geared toward children K–5.*

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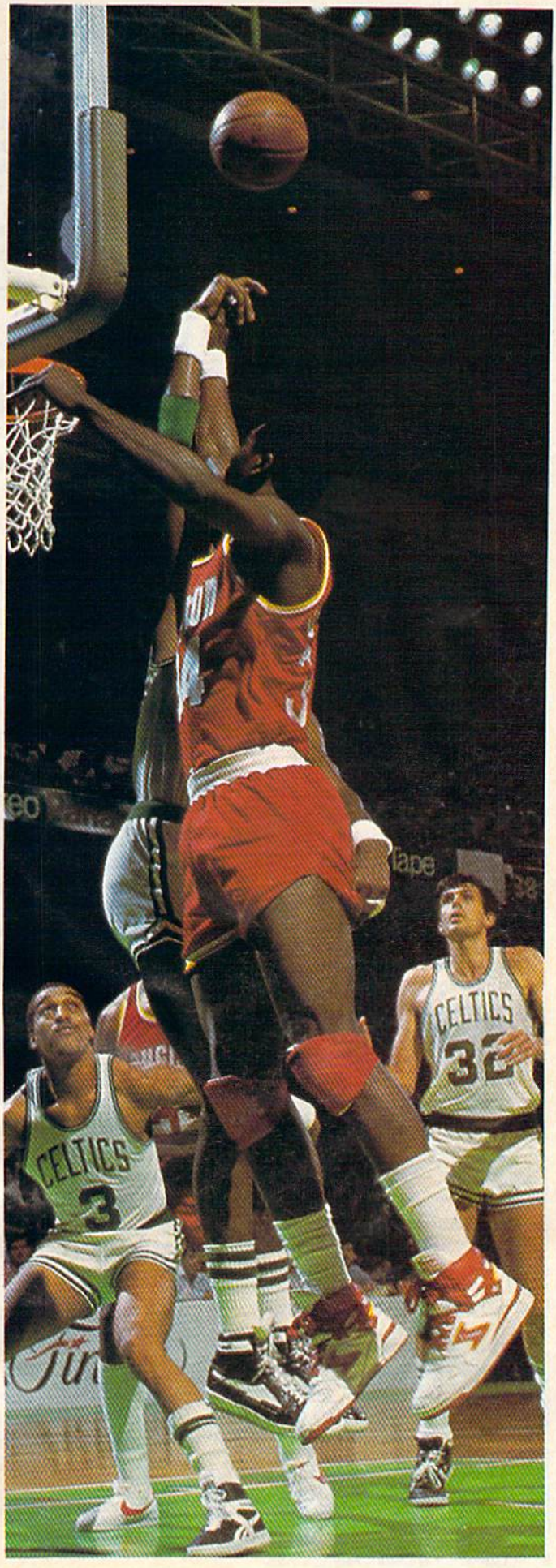

Create A Calendar
Epyx
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This program helps users create calendars with over 100 borders, graphics, and fonts. Graphics from the *Graphics Scrapbook* collection or *Print Shop* and text notes can be added to the calendars. Events that occur regularly throughout the year can be automatically scheduled; plus, a list of events from the calendar can be printed. Calendars can be 8½–11 inches, up to a six-page horizontal banner in size. Any year from 1753 through 9999 can be displayed.

DOODLE!
Crystal Rose Software
$39.95

This machine-language drawing program enables users to create and print out high-resolution graphics. Features include *stamp*, which repeats nine graphics, *letter*, which varies the size and style of characters, *mirror* to create mirror images, and *copy*, which can duplicate, squeeze, reduce, enlarge, stretch, rotate, or reposition the graphic. There are also drawing commands such as *line*, *fill*, *zoom*, *boxes*, *circle*, and *sketch*, which contain nine pen sizes and erasers, and nine paintbrush speeds. Graphics can be drawn in 16 colors and a negative image can be created. Printouts can be made using most Commodore-compatible printers.

Flexidraw Version 5.5
Inkwell
$34.95

This newest version of *Flexidraw* includes data entry device support of Koala Touch Pad, Commodore-compatible joysticks and mouse devices, and Inkwell light pens; the package does not include any of the devices. Drawing features include geometric shapes, line widths, copy, paste, edit mode, erase, fill patterns, 90-degree rotation, object flip, and ten font styles in three sizes. *Flexidraw* allows freehand and point-to-point drawing in hi-res black and white. There's also a color-addition program, a modem transmission program, sprite editor, sprite animator, and a program to view pictures without the menu bar.

The Graphics Magician Junior
Polarware Software
$19.95

The computer does the drawing with this graphics program; users just point at an object, click, and it is drawn. *Graphics Magician Junior* offers circles, boxes, triangles, straight lines, fill, brushes, and over 256 colors and patterns. Joystick, keyboard, or touch-table input is accepted. The program is not copy protected.

Graphics Master
ShareData
$12.99

With this program, users can create custom graphics and character sets for presentations, or copy, flip, mirror, and magnify images. No special tools are required. The program works with a keyboard, mouse, joystick, or graphics tablet and is compatible with almost any printer.

Moving Pictures
CDA
$29.95

This easy-to-use animation program allows you to create movies using frames from a drawing program such as *Flexidraw* or *DOODLE!*. Movies can can be viewed with a few simple commands or can be combined with BASIC programs. Screens can be split between text and movie. Movies can be paused, sped up, or slowed down while running.

Mr. Pixel's Cartoon Kit
Mindscape
$9.95

Children can create animated cartoons by using the program's collection of cartoons and characters, or by drawing their own figures using menu commands.

Mr. Pixel's Programming Paint Set
Mindscape
$9.95

A drawing program for children, the *Paint Set* helps students understand the basic concepts of computer programming logic while they use the computer to draw. For ages 8 and up.

Teddy Bear-Rels of Fun
DLM
$39.95

Teddy Bear-Rels of Fun contains a program disk and a graphics library with over 200 pieces of art to create stories, pictures, posters, labels, stickers, and other items. The art includes borders, backgrounds, characters, a variety of typestyles, and a text writer so captions and dialogue can be added to the pictures. The two-disk package is designed to enhance learning in art, math, and language. Projects can be printed on black-and-white or color printers.

Clip Art

Awesome Art #1
Chipmunk
$9.95

A collection of 103 graphics that can be used with *Print Shop*.

Clip Art Collection, Volume 1
Springboard
For *The Newsroom*
$29.95

A collection of over 600 pieces of clip art to use with *The Newsroom*, this selection features people, music, holidays, flowers, religious symbols, sports, and animals.

Clip Art Collection, Volume 2
Springboard
For *The Newsroom*
$39.95

This collection of clip art for use with *The Newsroom* features medical, daycare, realty, industry, office, shopping, travel, and other business-related graphics. Over 800 pieces of clip art are included.

Clip Art Collection, Volume 3
Springboard
For *The Newsroom*
$29.95

This selection of clip art for *The Newsroom* offers over 600 sports and recreation pieces, including tennis, skydiving, baseball, fishing, soccer, track, and camping.

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For *GEOS*
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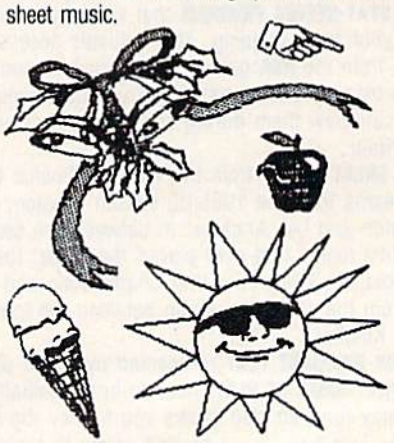
Each disk in this series contains a variety of graphics that can be copied onto documents using *GEOS*. Disk 1: a collection of holidays and weather graphics, plus two pages of tips for using *geoPaint*. Disk 2: little guys, holidays, and musical graphics, as well as a U.S. map, workdisk labels, and tips for *geoPaint*. Disk 3: wheels-and-things graphics—vehicles, Porsche 959, tin lizzies, warbirds, DC-3 Airliner, F4 Phantom, and Nieuport 17 WWI. Disk 4: little guys, foodstuff, tools, ovals, blocks, Commodore 64 and peripherals, spring, and summer graphics. Disk 5: vehicle wheels, flowchart symbols, little women, drafting equipment, banners, and houses. Diskforms contains five blank, preruled forms and three ready-to-print forms. The Musi-Kit disk has graphics for creating sheet music.



Diskart *offers a variety of graphics that can be used with* GEOS.

Graphics Companion I
Datasoft
For *Video Title Shop*
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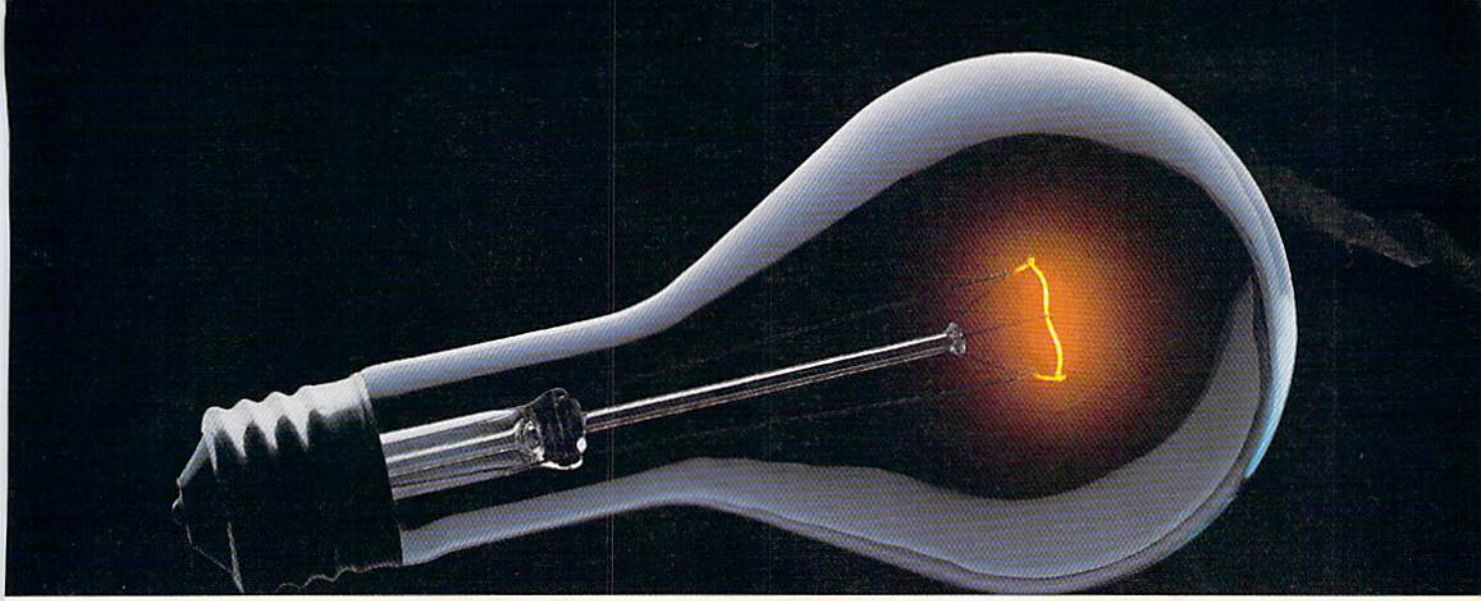
For use with Datasoft's *Video Title Shop*, this clip-art package contains 25 predesigned screens and five borders. The screens and borders cover major holidays and special occasions such as Christmas, New Year's Day, birthdays, and weddings. The user can modify the screens or add text and save the screens to disk.

Graphics Converter
Cardinal Software
$19.95

Graphics from *Print Shop* can be converted to work with *Print Master*, and *Print Master* graphics can be converted to work with *Print Shop*. Most of the converted graphics can also be printed.



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Springboard
For *The Print Shop*
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The *Expander* includes over 300 graphics that can be used with *The Print Shop* to create banners, letterhead, cards, and signs. The program offers drawing and editing tools to change the graphics or design new, original ones. Text can be added to the artwork, and hi-res pictures from other programs can be modified to use with *The Print Shop.*

The Graphics Galleria
Inkwell Systems
For *Flexidraw* or *DOODLE!*
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The Graphics Galleria is a collection of clip art that can be used with either *Flexidraw* or *DOODLE!* Each disk is sold separately and contains graphics on a theme such as maps of the world, borders and signs, holidays, animals, potpourri, and needlegraphics.

Graphics Scrapbook Chapter I: Sports
Epyx
for use with drawing program
$24.95
A collection of over 100 graphics that can be used with *Create a Calendar*, *Print Magic*, *The Print Shop*, *PrintMaster*, or *PrintMaster Plus.* Graphics cover sports—football, baseball, basketball, swimming, hockey, bowling, gymnastics, and aerobics.

Graphics Scrapbook Chapter II: Off the Wall
Epyx
for use with drawing program
$24.95
This collection of clip art contains graphics for holidays, punk rockers, punks, jesters, party animals, body parts, and other out-of-the-ordinary images.

Graphics Scrapbook Chapter III: School
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for use with drawing program
$24.95
Over 100 graphics, fonts, and borders for school use are in this collection of clip art. There are graphics for geometry, driver's education, New Year's Day, birthdays, raising funds, teachers, students, cheerleaders, graduation, school plays, and other subjects.

Masterpieces I (Flags of the World)
Free Spirit Software
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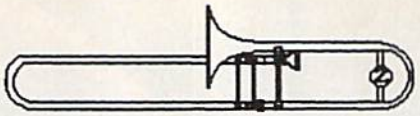
Masterpieces I is a collection of hi-res drawings of flags from 180 countries. The drawings can be printed to a Commodore 1525 or compatible printer; the drawings will print in color on a color printer. *Masterpieces I* is the first in a series of collections of drawings of objects and works of art from Free Spirit.



More Diskart
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More Diskart is four new disks (*Diskart 5*, *6*, *7*, and *Musi-Kit*) for use with *GEOS.* The disks contain clip art, illustrations, and the ability to produce sheet music. Users can paste graphics directly into *geoPaint* and *geoWrite* documents. All diskart graphics are directly compatible with *GEOS 128.*

Postcards
Activision
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Postcards is a collection of clip art—warthogs, dogs, rhinos, Mona Lisa, food, aliens, and more—that can be used to create postcards, invitations, memos, and other personal notes. Also included are backdrops such as landscapes and beach scenes on which to place the graphics. Personal messages can be typed in, or phrases and letters from the collection can be added. A paint program is included so users can design their own notes.

Print Shop Graphics
Compucats
For *The Print Shop*
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The Print Shop Graphics Library Disk 2
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For *The Print Shop*
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Over 100 graphics for use with *The Print Shop* are on this disk. Categories include hobbies, occupations, travel, music, and health.

The Print Shop Graphics Library Disk 3
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The Print Shop Graphics Library Holiday Edition
Brøderbund
For *The Print Shop*
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This special-edition library includes graphics for Easter, Christmas, Hanukkah, New Years, and 22 other holidays. For use with *The Print Shop.*

Shapes & Fonts II
Baudville
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Video Title Shop Companion
DataSoft
$19.95
This library of graphics contains 25 pictures for holidays and special occasions such as Christmas, New Year's, Easter, Valentine's Day, Thanksgiving, vacations, birthdays, weddings, anniversaries, and graduations.

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AwardWare
Hi Tech Expressions
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Traditional certificates, awards, licenses, signs, and announcements can be printed with this program. Users can create coupons, tickets, checks, stationery, memos, and other awards. There are 20 graphics, 20 borders, five fonts, five seals, and text borders.

The Banner Machine
Cardinal Software
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Signs of any length with letters in eight sizes, ranging from ¾-inch to 6½ inches, can be constructed with *The Banner Machine.* Five letter styles and 15 backgrounds are included in the program. Additional fonts are also available—*Font Disk II* and *Font Disk III* each contain four additional fonts for $39.95 each. A complete package with 13 letter styles is available for $99.95.

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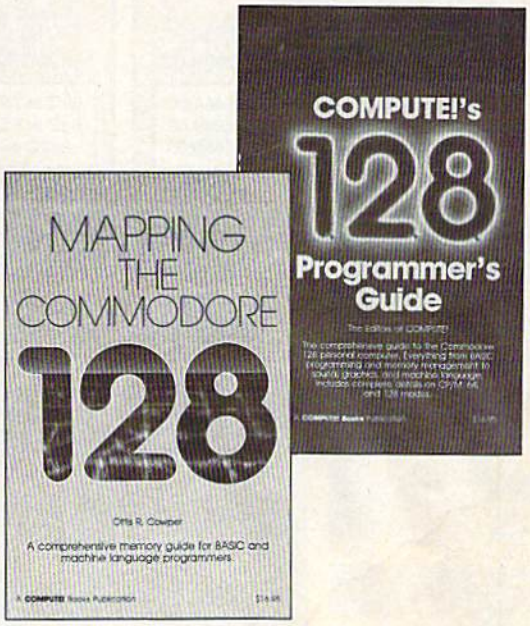

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A sample picture menu from Certificate Maker

Create with Garfield!
DLM
$29.95
Students can create cartoons, posters, and labels with Garfield and his friends. The program features 75 pieces of artwork and captions, and can be printed in black and white. The package includes an activities sheet that lists ways to use *Create with Garfield!* at home and in school.

Students can be artists with Garfield.

Create with Garfield! Deluxe Edition
DLM
$39.95
This two-disk package helps students improve their artistic skills while they create Garfield posters, cartoons, and labels. The students choose a background and characters, and then create a scene and add dialogue or captions. There are over 200 pieces of art and borders, and a variety of typefaces included. The finished product can be printed on a color printer. An activity sheet lists different ways the program can be used at school or home.

Graphic Labels
Chipmunk
$9.95
Text can be mixed with graphics from *Print Shop* library to create labels. The package includes the program, instructions, and a collection of graphics.

Greeting Card Maker
Activision
$34.95
This card-generating program helps users create and print invitations, announcements, and pop-up cards. There are two dozen background patterns and borders, eight type styles, pictures, designs, scenes, and a variety of verses.

HeartWare
Hi Tech Expressions
$9.95
Greeting cards of friendship, love, and appreciation can be printed using an assortment of graphics: flowers, a rainbow, butterflies, and more. The animation can be personalized with an original friendship greeting.

JingleDisk
Hi Tech Expressions
$6.95
A selection of full-page graphics or folded cards can be printed for customized season's greetings.

PartyWare
Hi Tech Expressions
$14.95
Invitations, thank-you notes, and greeting cards for parties and other special occasions can be printed with this program. Users can also design their own party decorations and make banners, hats, placemats, and more. The cards can be saved to disk. The program includes a variety of graphics, greetings, and borders.

The Print Shop
Brøderbund
$44.95
Cards, flyers, stationery, and signs can be created and printed using *The Print Shop*. There's an assortment of pictures, symbols, borders, backgrounds, and type fonts and sizes to select, and the graphics and text editors allow the user to make simple changes. The program prints to most Commodore-compatible printers and accepts keyboard, joystick, or Koalapad input. The package includes color paper and envelopes.

The Print Shop Companion
Brøderbund
$34.95
This program offers a variety of new features to be used with *The Print Shop*. It includes a font and border editor and an enhanced graphics editor. There are additional typefaces, borders, and graphics, plus a tile maker and a calendar designer with monthly and weekly formats.

The Toy Shop
Brøderbund
$29.95
This package helps users design 20 working mechanical models such as a scale model of the Spirit of St. Louis, a balloon-powered steam engine, a flying propeller, or a tractor crane. The user selects a design and customizes it by adding patterns, graphics, and text. The design is then printed, mounted on adhesive cardstock, cut out, and put together. The package contains the adhesive cardstock, wire, wooden dowels, rubber stripping, cotton cord, and balloons, plus illustrated instructions. For ages 12 and up. A refill package of supplies is available for $24.95.

Use a Doodle
Chipmunk
$6.95
This BASIC program shows how to use artwork created with *DOODLE!* in other programs. It also contains the programs *View Doodle* and *Doodle Slide Show*.

Video Title Shop
Datasoft
$29.95
Video Title Shop helps design text, borders, and graphics screens to add to videotape recordings for home and business presentations. The program offers fades, wipes, fizzles, scrolling, cycling between screens, and a variety of font styles and sizes. Graphics can be created with *Micropainter Plus*, a graphics program containing four pens and 16 colors, which is included in the package. Version 2.0 also includes an optional continuous loop and an abort-from-sequence command.

Desktop Publishing

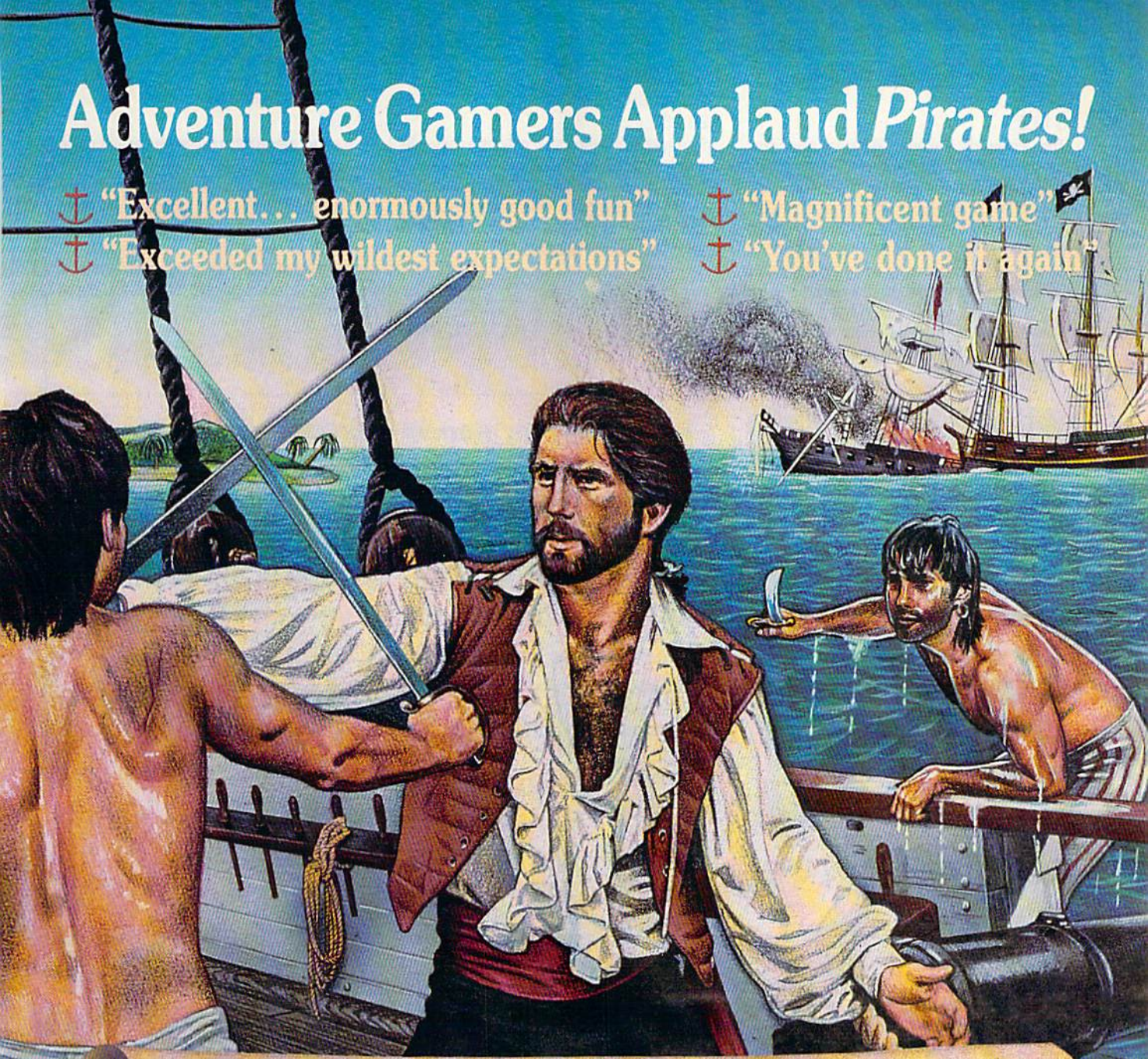
geoPublish
Berkeley Softworks
for *GEOS*
$69.95
Users can create multipage documents containing text, graphics, and a variety of font styles with this desktop publishing software. *geoPublish* features a master page that allows the user to repeat graphics and text on each page, a preview of all pages before printing, zoom display, and a toolbox for graphics. The text retains formatting from the *geoWrite* document, including font style and size, tabs, centering, justifications, paragraph breaks, and inserted graphics. Layout consists of dividing each page of the document into rectangular areas. Documents can be printed on *GEOS*-compatible printers, and a *PostScript* driver is included.

The Newsroom
Springboard
$49.95
Desktop publishers can use this program to create newsletters for family, clubs, school, or business. *Newsroom* contains a word processor and over 600 pieces of clip art. Text wraps around any photos and graphics added to the composition. There are five fonts in which to enter text, and text can be printed out on most printers.

Adventure Gamers Applaud *Pirates!*

⚓ "Excellent... enormously good fun" ⚓ "Magnificent game"

⚓ "Exceeded my wildest expectations" ⚓ "You've done it again"



"**PIRATES!** *is excellent... a great swashbuckling game,* **enormously good fun...** *it should keep you playing for months."*
(Popular Computing Weekly, U.K.)

"...your game has **exceeded my wildest expectations...** *I have run up more game time on the computer in 3 days than in the entire month previous."* **(C.J.M., Buffalo, N.Y.)**

"This is one of the most **magnificent games** *I have ever had the pleasure of playing! It has exactly the balance of realism, playability and silliness that I most adore."* **(J.P.S., San Diego, CA)**

"PIRATES! *is a big hit in the Dallas area. This game is one of your best efforts. The graphics on all screens are excellent!* **You have done it again,** *Microprose."*
(Larry Medlin, DallasGamers, in Game News)

PIRATES! It's another winner from Sid Meier, author and designer of the award-winning F-15 STRIKE EAGLE and SILENT SERVICE. His creative genius has combined the best of simulation, role-playing and strategy games in this high seas adventure.

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PIRATES! is available at your local "Valued MicroProse Retailer" (VMR). Call for locations nearest you. Get it today for Commodore 64/128, IBM-PC/compatibles and the Apple IIc and 128K IIe. Call or write for MC/VISA orders if product not found locally.

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Timeworks Desktop Publisher
Timeworks
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The *Timeworks Desktop Publisher* word processor features a variety of fonts, kerning, italicizing, outlining, line justification, spacing, and the ability to mix text with graphics. Hi-res graphics from major graphics programs can be used with *Desktop Publisher*. Graphics can also be created freehand or by using tools such as lines, boxes, polygons, circles, and patterns. Pages can be designed with varying margin widths, columns, rules, screens, bars, boxes, and headers, and the document is printed using a WYSIWYG format.

Graphics Utility Programs

Billboard Maker
Solutions Unlimited
$34.95
Billboard Maker allows the user to enlarge printouts from 8½ × 6½ inches to 4 × 3 feet. It can dump text to the printer and move graphics into programs. The typesetter option lets users overlay text, and enlarged graphics can be smoothed with the optimizer feature. Pictures generated with the program can be moved to other programs. The program works with most major paint and draw programs.

Flexifont
Inkwell
Flexidraw Version 5
$29.95
This font- and character-generating package is designed to be used with Inkwell's *Flexidraw Version 5*. It contains 33 letter styles and has custom lettering and editing capabilities.

Graffix-Link
Solutions Unlimited
$19.95
Graffix-Link allows the user to convert artwork into and from a *geoPaint* format. The utility can also be used with *Billboard Maker* to create signs with *geoPaint* drawings. *Graffix-Link* works with standard hi-res files and is menu driven.

Icon Factory
Solutions Unlimited
$34.95
Users can assemble pictures from graphics libraries or convert graphics to other formats with this program. The utilities can enlarge, smooth, and reduce graphics, or change graphics from hi-res to multicolor modes. *Icon Factory* works with major paint and draw programs and graphics files.

Photo Finish
Solutions Unlimited
$29.95
This screen dump program contains a color editor, gray scale editor, and preview feature. Printer setup can be user defined, and the program uses the optimizer feature to smooth the screen dump. *Photo Finish* works with most paint and draw programs and graphics files.

Screen F/X
Solutions Unlimited
$34.95
Slide show presentations can be created using *Screen F/X* and its script editor. There are over 100,000 combinations of effects that can be blended together to form pictures, and more than one disk can be used for long shows. The F/X Executor allows other users to view the shows without the master program, and F/X Processor supports graphic formats and public domain/Flexi fonts.

Manufacturers' Names and Addresses

Abacus Software
5370 52nd St. SE
Grand Rapids, MI 49508

Activision
2350 Bayshore Frontage Rd.
Mountain View, CA 94043

Baudville
5380 52nd St. SE
Grand Rapids, MI 49508

Berkeley Softworks
2150 Shattuck Ave.
Berkeley, CA 94704

Broderbund
17 Paul Dr.
San Rafael, CA 94903

Cardinal Software
14840 Build America Dr.
Woodbridge, VA 22191

CDA
561 N. Main St.
Yreka, CA 96097

Chipmunk Software
Box 463
Battleground, WA 98604

Compucats
Distributed by Master Software
6 Hillery Ct.
Randallstown, MD 21133

Crystal Rose Software
109 S. Los Robles
Pasadena, CA 91101-2417

Datasoft
19808 Nordhoff Pl.
Chatsworth, CA 91311

Digiscape Software
P.O. Box 113058
Carrollton, TX 75011-3058

DLM
P.O. Box 4000
One DLM Park
Allen, TX 75002

Epyx
P.O. Box 8020
600 Galveston Rd.
Redwood City, CA 94063

Firebird Licensees
P.O. Box 49
Ramsey, NJ 07446

Free Spirit Software
538 S. Edgewood
LaGrange, IL 60525

Hi-Tech Expressions
1700 NW 65 Ave.
Suite 9
Plantation, FL 33133

IHT Software
2269 Chestnut St.
Suite 162
San Francisco, CA 94123

Inkwell Systems
P.O. Box 85152 MB290
5710 Ruffin Rd.
San Diego, CA 92138

Mindscape
3444 Dundee Rd.
Northbrook, IL 60062

Polarware/Penguin Software
830 Fourth Ave.
P.O. Box 311
Geneva, IL 60134

Scholastic Software
2931 E. McCarty St.
P.O. Box 7502
Jefferson City, MO 65102

ShareData
7400 W. Detroit St.
Suite C-170
Chandler, AZ 85226

Solutions Unlimited
P.O. Box 177
Dobbs Ferry, NY 10522-0177

Springboard Software
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Minneapolis, MN 55435

Those Designers
3330 Lewis Ave.
Signal Hill, CA 90807

Timeworks
444 Lake Cook Rd.
Deerfield, IL 60015

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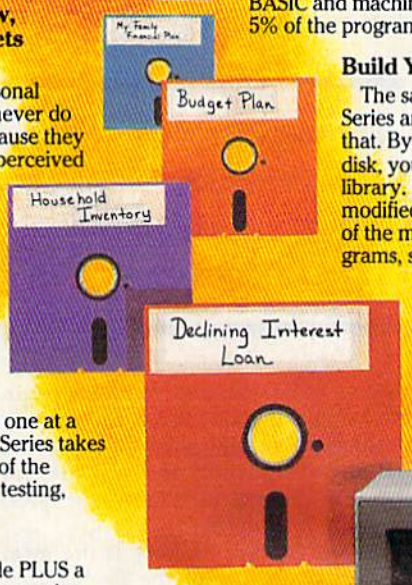

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Beyond Zork

"You are standing on a narrow path which curves along a rocky ledge overlooking the sea. You press your back against the sheer cliff wall, trying not to hear the waves crashing on the rocks, far below. An inscription is carved upon the face of the cliff which reads:

My tines be long,
My tines be short,
My tines end ere my first report.
What am I?"

Those of us who have traversed the Great Underground Empire of *Zork I*, *Zork II*, and *Zork III* may recognize that familiar style of interactive storytelling and smile. Those who have not are in for a treat. Infocom has done it again. *Beyond Zork* has arrived, and it is everything we would expect from an adventure game that bears the *Zork* name. A new universe, created by the award-winning author of *Trinity* and *Wishbringer*, Brian Moriarty, is there for the exploring.

The *Beyond Zork* scenario deposits us in the Kingdom of Quendor, across the sea from the Great Underground Empire. You, a mere peasant, must unravel the mysteries that have bewitched this land. All the Wizards have vanished. Dangerous characters and monsters roam the streets and countryside of this once-fair empire. Only by seeking out and locating the famed Coconut of Quendor, mystic relic, and all-powerful wellspring of Magick, can this world return to its not-so-normal state.

Most of what you need to advance within the game can be found in several shops. Items such as swords, battleaxes, protective clothing, and various magical equipment must be purchased. Your neighborhood Magic Shop, Weapons Store, and Fashion Boutique are all located in different cities. An impoverished vagabond like yourself must locate things of value in your travels and sell them for Zorkmids, the official coin of the realm. Only then can you afford the finer things a well-heeled adventurer needs to save a distressed civilization.

The game begins by asking if you would like to begin with a "set" character already generated by the computer, with designated abilities. Or, if you wish, you may design a character of your own, giving him or her varying amounts of endurance, luck, intelligence, compassion, and strength. When requested, bar graphs displaying the percentages of these individual attributes appear in a boxed area at the top of your screen. These graphs offer an at-a-glance look at your ever-changing abilities. The graphs also automatically appear when there is a change in your status. For example, if you are attacked and injured by one of the game's monsters, the endurance graph displays your declining endurance until you defeat your foe or flee the area. When your endurance has reached its end, then so have you, and you must begin the game anew. Of course, saving your position at several points throughout the game is advised and will prevent you from having to restart your quest from the beginning.

The story intimately involves the player, making the game as addicting as any best-selling novel.

Brian Moriarty's story is the most impressive feature of the *Beyond Zork* experience. Capturing the imagination, the story intimately involves the player with the interaction, making the game as addicting as any best-selling novel. I found myself playing *Beyond Zork* hours past the time I had set aside for it. I have read opinions about text-only adventure games becoming obsolete due to the advent of flashier, hi-res graphics adventure games. I don't agree. Not that these graphics adventures are not wonderful in their own right, but the pictures they produce cannot compare with the pictures generated by well-written text in the most sophisticated computers anywhere: the human mind.

This self-booting program is written for the Commodore 128, and you'll need an 80-column monitor and either a 1541 or 1571 disk drive to play the game. All the features of the program are well documented within the unique packaging, and, as usual, Infocom's documentation is presented in an entertaining and easy-to-understand manner.

A colorful 17 × 22-inch pictoral map of The Kingdom of Quendor is supplied with the package. While the map is nicely drawn and is of a quality that any adventurer would be proud to display, it cannot be used to direct you through the game. Using it would be like trying to use a satellite weather photo as a road map. An onscreen map is displayed alongside the text area, as you move around within the program. This map is very handy for knowing where you are and is helpful in planning your next move. Only the rooms directly around you are displayed here, however, so your adventure map-making days are not over.

A nice addition worth noting is the program's use of the 128's function keys. Each key can be used as an abbreviation of any command you choose. If you find that you often use a certain sentence like "Drop all but the lamp," all you have to do is to set a function key and voilà, with a single keystroke, your sentence is there. Long or difficult words you'll encounter in the story are also good candidates for this option.

Like most programs from Infocom, *Beyond Zork* requires regular access to the disk drive. Every time you press RETURN for a move or action, the program searches the disk for information. Although I've never had any trouble with my drive, even after hundreds of hours of adventuring, I still find myself fretting about it.

At the beginning of this article, I paraphrased some of *Beyond Zork*'s great text, which included a riddle. The fun of these games is to unravel these mysteries all by yourself, but I won't leave you without a nudge in the right direction. Think of *report* as a loud sound and not its usual meaning of disclosing information.

The rest is up to you.

—Steve Hedrick

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Video Title Shop

Three years ago, this program would have made my life much simpler and probably more rewarding. I had purchased a 64 for the exclusive purpose of making title sequences for video productions. Involved were long nights of learning to program the computer in order to create rudimentary animations for the professional videos I was shooting during the day. With *Video Title Shop*, I would have gotten more sleep, would have been able to charge higher prices for my work, and would have turned out titles and graphics of better quality than I achieved by hacking. I might not have become rich, but I could've been a contender.

The key to learning and using *Video Title Shop* is in understanding that it is two separate but compatible programs (*Video Titler* and *Micro Painter Plus*) rather than one comprehensive program. Learning its operation is simplified by breaking the process down into component parts, and Datasoft is to be commended for choosing this approach.

Micro Painter Plus is a drawing and painting program that you use to make backgrounds or frames for your titles. Though these will be static drawings—not animated—they can be subject to manipulations such as fades and wipes.

Your tools in *Micro Painter* include four pens with which to draw, the capability of straight line or freehand drawing, four pen speeds, sixteen colors, magnification, and "undo," which allows you to cancel your last action.

Unlike other painting programs, the four pens here are not different sizes. Pens are differentiated in order to keep your drawing clean and free from color bleed. In practice, the approach works this way: If you use pen 2 to draw an orange square, then change that pen color to purple and draw a design within that square, the colors bleed or fuzz together. Using a different pen for purple prevents this.

Magnification gives you an enlarged view of a small portion of your screen, allowing you to work on it at pixel level. This is useful for putting the finishing touches on an object or for correcting a line that may not have turned out quite the way you wanted. Because you are working at a pixel level, it is also possible to use this feature to edit and change the fill patterns used by *Micro Painter*, thus giving them a new texture.

As with any other drawing and painting program, *Micro Painter Plus* is only as good as the talent and patience you bring to it. Give it these two things, and you can create very good backgrounds for your titles.

Video Titler operates on two levels:

creation and execution. Titles are created in what are called *objects*. Objects are areas bounded by elastic-dotted lines into which you type the words of your title. Using this system, each object can be manipulated separately. Let's say you create the title "Our Summer Vacation." Putting all the words in one object means they will be acted upon together and that they will all be of the same character font. Putting them in different objects means you can use a different effect on each word: "Our" in a small solid font, "Summer" in a larger font that cycles through colors, and "Vacation" in a still larger font that slides up from the bottom of your screen.

Video Title Shop *is one of the simplest and least expensive ways to dress up your videos.*

Ideally, you first create your background with *Micro Painter Plus* and use it as an easel upon which to superimpose your title. This allows you to experiment with the formatting and placing of your titles.

As with *Micro Painter*, the *Video Titler* provides four pens, and to the same purpose: to prevent color bleeding. Other tools available are a selection of 16 colors, page selection, timing, a variety of font sizes, and insert and delete functions that work as they would on a word processor.

To explain the page system, consider the opening title of the program: a screen "fizzles" (appears pixel by pixel) to reveal an oceanscape (the background). Near the top of the screen, a black square grows in size, forming the credits. A second later, the title appears with another line unrolling near the center of the screen. And finally, another credit line appears near the bottom of the screen. This sequence occupies 12 pages, or screens. The "screen" approach greatly simplifies things for you.

The backgrounds you create can be duplicated from one page to another. In the above example, the sequence was reproduced using 12 separate pages. (Because the same background is retained, you are never aware of page changes taking place.) Each of the actions occupied a page: There was the "growing square" page, the changing of the square to a credit, the credit frozen while the title appeared and so on.

Video Title Shop does not restrict you to this approach. It is possible to use more than one background for a title. Perhaps one page fizzles out (fizzling being the computer equivalent of a fade or a lap dissolve), only to be replaced by the next page. You can also scroll text, paint it across the screen, wipe in any of the four directions, and control the length of time a page is onscreen before being replaced by another page.

Based on my own teaching experiences, one of the most difficult concepts for a novice to grasp is that of recording computer output onto a video recorder. You'll be happy to know that the documentation for *Video Title Shop* treats the subject in depth.

As far as the documentation itself is concerned, I find some fault with its organization—the topic of recording comes first, before you have anything to record. In the sections on using and working with *Video Titler* and *Micro Painter Plus*, the information seems to suffer from the same lack of organization. However, the manual does tell you everything you need to know, and there are quick reference cards to remind you of the many keyboard commands used in each program.

How do you use it and who would be interested? Any home video ever made would benefit from titling. More than anything else that you can do with your camera, the presence of titles is the one sure way of giving your videos a beginning and an end. Because output is to videotape, many short title sequences can be strung together into one long sequence, including all the information you feel is necessary. You can then dub to the audio track.

Whether you shoot home movies or are involved in small-scale professional video production, *Video Title Shop* is one of the simplest and least expensive ways to dress up your product.

Video Title Shop is a product of DataSoft and is distributed by Electronic Arts. Also available are Graphics Companion disks which are loaded with ready-made background pictures appropriate to most social, family, or business occasions.

—Ervin Bobo

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The Commodore 2002 Monitor

Commodore has recently released the 2002, a new 13-inch color monitor that works well with Commodore's entire line of computers—the 64C, 128, 128D, Amiga 500 and 2000, and the PC 10. Although it is functionally identical to the 1080 monitor originally sold with the Amiga 1000, it is different in style—reflecting Commodore's new image—and it looks good with all Commodore computers.

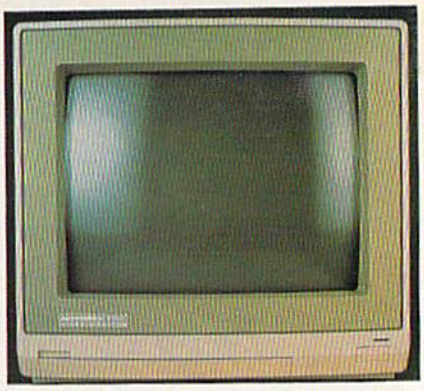
The real beauty of the 2002 is that you can use it with your current computer, and if you upgrade later, you won't have to buy a new monitor. Since a color monitor is a significant expense in the cost of any system, this is a big plus. And perhaps best of all, the 2002 is no more expensive than an average RGB monitor—and it is *less* expensive than many.

Commodore has a history of providing its users with excellent monitors. The 1702—released as a monitor for the 64—was a first-class display at a reasonable price. And Commodore offered something extra. Instead of the ordinary composite signal used by most microcomputers, the 1702 offered *separated composite* video, which separates the color (chroma) and intensity (luma) parts of the signal and produces a strikingly better picture than a straight composite. Subsequent Commodore monitors that offered composite video supported separated composite, too.

When the 128 arrived on the scene, in addition to its 40-column 64 and 128 video modes, there was something new—an 80-column color mode. A good 80-column display demands a higher-resolution color signal than is possible with composite—even separated composite. So, in addition to the composite video of the 40-column modes, the 128 produces an RGB digital signal for its 80-column color screen.

The 128's RGB signal is the same as the one the IBM PC with a CGA card uses, and it is the same signal used in Commodore's own PC 10s. Commodore designed the 1902 monitor to support all of the 128's video modes. It accepts composite, separated composite, and RGB digital signals. When the PC 10s arrived, many dealers sold a 1902 monitor with those systems.

For the Amiga 1000, the resolution of composite video and even RGB digital signals was not sufficient. The Amiga's graphics needed an RGB *analog* signal to be seen at their best. But the designers wanted the Amiga to be able to use composite and RGB digital monitors as well as RGB analog, so these capabilities were also included. The 1080 monitor was born. It displays all the signals of the 1902—composite and RGB digital—as well as the new super-high-resolution RGB analog signal.



The real beauty of the 2002 is that you can use it with your current computer, and if you upgrade later, you won't have to buy a new monitor.

Having a different monitor for each computer in a line as far-ranging and extensive as Commodore's must have been expensive for the company. It certainly could be expensive for users who stayed with Commodore computers but needed a new monitor for each machine.

Commodore has answered many needs with the 2002—a monitor that works equally well with all of Commodore's computers and one that stylistically reflects Commodore's newest image. The 2002 has four modes: composite, separated composite, RGB digital, and RGB analog. It is designed in the style that Commodore started with the 128 and has continued with the 64C, Amiga, and PC 10. The monitor case has a classic, conservative look, and the display—the real reason for buying any color monitor—is crystal clear in every mode and with every Commodore we've tried. It appears that Commodore has come up with a real winner. After all, who can argue with a universal monitor?

—*Clifton Karnes*

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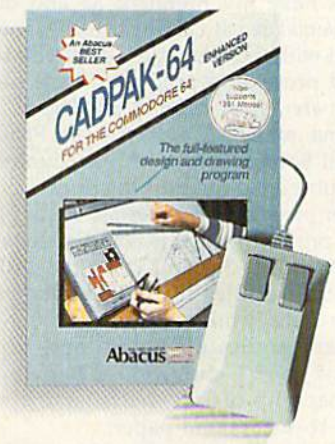

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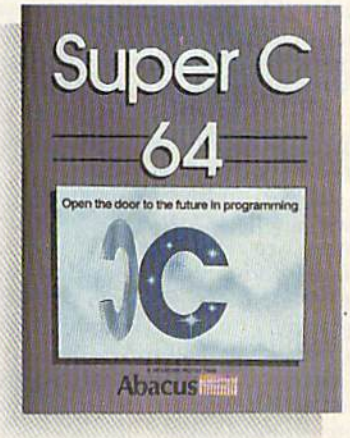

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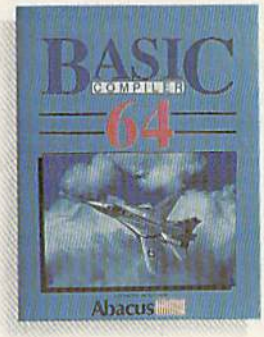

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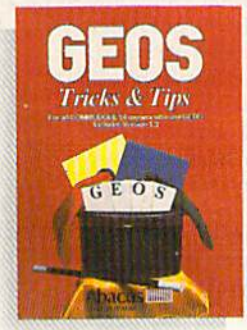

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Premiere 35 Daisywheel Printer

A few years ago, when I first became interested in computers, I bought a 48K system and a cassette drive. It took days (almost) for a single program to load. Then the emphasis shifted to speed, and the disk drive became the primary storage medium. That quest for speed led me to buy a dot-matrix printer capable of printing 100–160 cps (characters per second). I enjoyed its speed and graphics capabilities, but placed little emphasis on the print quality.

As my printing requirements increased, dot-matrix printers also became more sophisticated. Printers surfaced with enhanced modes called NLQ (Near Letter Quality), producing print quality that ranged from tolerable to almost letter quality.

Soon, the emphasis shifted from speed to quality. The need for more professional-looking documents became the norm, and daisywheel printers surfaced to meet those needs. Out of the pack of daisywheel printers came the Premiere 35 by Citizen America Corporation. Pound for pound and dollar for dollar, this is one of the true values in computer peripherals today. The printer comes with two spiral-bound manuals, which are well-written and easy to follow. The Premiere 35 uses print wheels that are interchangeable with the Diablo 630. It is compatible with Diablo 630, NEC 3550, or Qume Sprint II Plus printers through a series of dip-switch selections.

The printer is 22.8 inches wide, 15 inches deep, 5.7 inches high, and weighs 28.7 pounds. It can handle single sheets up to 17 inches wide, and will accept as many as six sheets at a time. A Centronics 8-bit parallel interface is standard (a serial option is available), and the printer also comes with a 12-month warranty.

Most daisywheel printers I've seen usually have a separate tractor or sprocket feeder, which sells for anywhere from $100 to $300. The Premiere 35, however, has a built-in tractor on the rear of the printer, which is recessed until needed. This eliminates the need for a separate tractor, and eliminates unsightly and bulky hardware.

I have my Premiere 35 and dual bin VersaFeed II cut-sheet feeder interfaced with a Commodore 128. The two word processing programs I use most often are *Pocket Writer 2*, by Digital Solutions, and *Fleet System 4*, by Professional Software. I haven't encountered any problems running the printer with either program. *Fleet System 4* has a Diablo printer file that is compatible with the Premiere 35, and I use the 1101/JUKI6000 printer file on *Pocket Writer 2*. They both work perfectly. The sheet feeder handles envelopes and paper from 7 to 12 inches wide, it has a hopper capacity of 200 sheets, and it will feed 16–24- pound paper.

It appears that most Commodore software developers fail to include parameters in their programs for installing sheet feeders. In order for the cut sheet feeder to work properly, control (decimal) codes must be sent to the printer by way of the word processing program. These codes may be sent to the printer by several different methods. Since the programs I use lack sheet feeder parameters, redefined character sets must be created. With *Pocket Writer 2*, you first enter the format menu and insert the control codes in the redefined character option in the form of 1 = 27 + 25 = 49. To activate bin 2, simply replace the 49 with 50. The 1 represents the redefined character, and is accessed by simultaneously holding the SHIFT and CTRL keys while pressing the 1 key.

I like to place the redefined character in the header option of the format menu. By doing this, the code will be the first signal received by the printer, thereby activating the sheet feeder. However, if I need to use the header option for page numbering, or to print other information, I simply place the redefined character at the beginning of each page. The process of creating a redefined character set using *Fleet System 4* is basically the same as with *Pocket Writer 2*.

Diablo Hytype II ribbons are used with the Premiere 35, and they're very inexpensive. I usually pay about $3 per ribbon, which is $7 cheaper than the ribbon I use on my dot-matrix printer. The control panel is located on the front left of the printer. It has an LCD display and six pressure-sensitive buttons.

Pound for pound and dollar for dollar, this is one of the true values in computer peripherals today.

These buttons allow you to control many of Premiere 35's printer functions and clock features. When an error occurs, the Premiere 35 sounds an alarm and displays the appropriate error message on the LCD display panel. Following is a list of the printer's various error messages and the action needed to correct each problem.

Check Paper: The printer is out of paper, or the paper is jammed. Simply load more paper and press the On Line button.

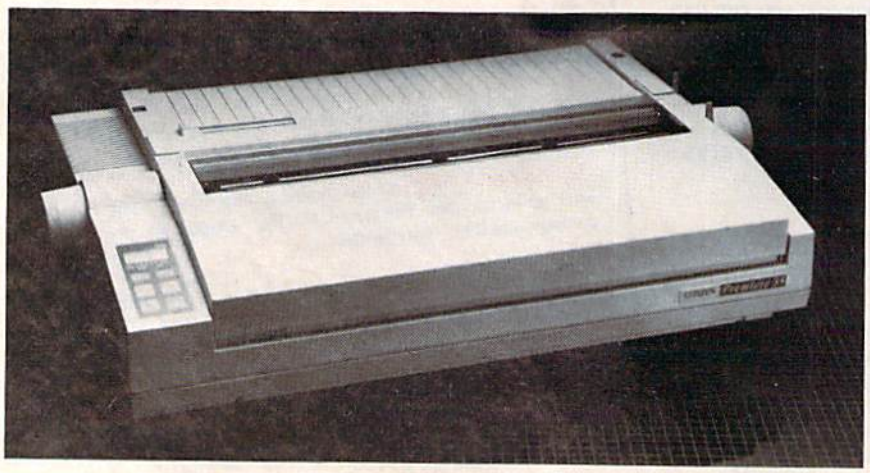
Check Ribbon: The printer needs a new ribbon, or the ribbon is jammed. Replace old ribbon and press the On Line button.

Check Wheel: The printwheel is jammed or not aligned correctly. Make sure the printwheel is firmly positioned on the print head, and press the On Line button.

Check Cover: The printer cover lid is open or ajar. Close cover and press the On Line button.

The line-spacing feature lets you select six, four, or three lines per inch. It is also possible to change line spacing to other increments by sending commands from your computer. The Premiere 35 can use printwheels designed for any of four different character pitches, which are 10, 12, or 15 characters per inch, or proportionally spaced wheels. It has a print speed of 35 cps, and the capability for automatic paper loading. It also comes with an 8K buffer.

One feature that is very attractive is its ability to microspace when printing text that is right justified. Micro justification simply means that the print head can move horizontally in increments as small as 1/120 inch. This feature allows the printer to insert a blank



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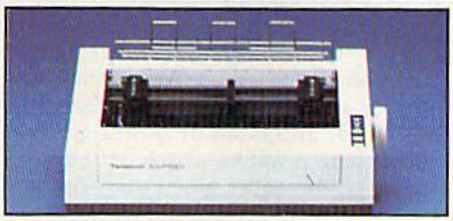

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space smaller than one character between words when text is being justified. Thus, the distance between each word appears more equal. Another useful and unique feature incorporated in this printer is a clock calender that lets you automatically print the time and/or date on your documents. You can print the time and date at the bottom of each page, which is especially useful for distinguishing among several revisions of a similar document. Or, you can insert the current date and/or time anywhere in the text, which is handy for giving a form letter a current look without changing your file.

Citizen has a real winner in the Premiere 35, and it's packed with features that, until now, were available only in printers costing more than twice as much. Citizen has a toll-free number (1-800-824-9921) to its technical support staff. The individuals I spoke with were very knowledgeable and extremely helpful.

Considering features such as a print speed of 35 cps—which is faster than my dot-matrix print in its NLQ mode—a built-in clock/calender, a built-in variable-width tractor, and a price tag under $500, this is the printer for anyone who has a need for letter-quality print.

—Julius Hornbuckle

The Premiere 35 Daisywheel Printer
Citizen America Corporation
2401 Colorado Ave., Suite 190
Santa Monica, CA 90404

Mini-Putt

It was probably inevitable. Computer golf games are proliferating like rabbits, but there are only a limited number of famous courses on which to play. So now Accolade, instead of taking you to Augusta or Pebble Beach (which they did in another game), has decided to take you just down the street and out behind the shopping center for a game of *Mini-Putt*, otherwise known as miniature golf.

Certainly you've been there and played it under one trade name or another. You step up to the Pro Shop, rent a ball and a putter, and take a stance on the first of the most unusual putting greens in the world. The greens are concrete sidewalks, covered with green carpet, bordered by concrete curbing and strewn with hazards that would cause any professional golfer to quail.

That's miniature golf and that's *Mini-Putt*, a faithful computer recreation of one of the most frustrating and fun games ever invented.

You begin the game by signing in at the Pro Shop. Up to four players can compete in a round, sharing the single joystick that's required. You next choose one of four courses, each more difficult than the last. You're ready to start the game.

The playing screen shows a section of the green, and the graphics are both colorful and sharp. Topography is indicated by shaded arrows that reveal the direction of the slope. The curbing is sharply outlined, while other hazards are either animated or indicated by color. (Blue is water—watch out for it.) Although the entire green isn't shown on the playing screen, a simple sideways move of your joystick will cause immediate screen scrolling so you can see what you're up against.

With the playing field occupying the upper two-thirds of the screen, the lower third is given over to a control section. At far left is the golfer (you) who will react to your shots with the proper emotion. A hole-in-one or a par will cause him to dance with joy; when you score over par, he sticks his head in a hole to hide his embarrassment; and other klutzy shots may cause him to break his putter over his knee.

The power window frames the golfer. The vertical part of the gauge corresponds to the length of the shot you're going to try, while the horizontal part relates to your aim. To shoot, move the cursor from the ball to where you wish to end up, and the power window shows you the distance. Click the fire button to shoot and the vertical gauge reacts like a rising thermometer. Click again when the "mercury" reaches the proper distance, and then watch the horizontal gauge. Clicking the fire button at dead center results in a straight shot, while clicking before or after this point will cause a right or left slant. If that sounds complicated, it is so only in the telling; in practice it's easy to get the hang of it.

As you might expect, knowing distance alone isn't enough for some shots. Shooting uphill requires more power. Therefore, a 12-foot putt might better be made by allowing the mercury to reach the 16-foot mark. Downhill strokes must be compensated for in the opposite manner.

After the power window, you see an overview of the entire green, useful for seeing the relationship between ball position and hole. Following that is a scoring section that reminds you of the par for the hole and, in a rather crass move, tells you exactly how many strokes you've really made.

These strokes, however, are related only to the hole being played. Once you sink a putt, the screen flips away and is replaced by a scorecard where each hole is listed and your total, so far, is included. Again, this will probably be an embarrassment, but it's a necessary part of the program.

After more than a week of playing *Mini-Putt* almost constantly, I believe the single most important factor in successful play is aiming the putt. Since this mirrors real-world experience, I deem it a plus. Fortunately, you cannot knock your ball into the neighboring green (as has been done in the real world) leading one to believe the curbing is infinitely high.

Mini-Putt is a faithful recreation of one of the most frustrating and fun games ever invented: miniature golf.

The power of your swing is more straightforward—at least while you are on level terrain. Going uphill or getting out of a water trap will require more force, while putting on a downhill slope may carry your ball farther than you intended. This can be beneficial, since some slopes form chutes that will take you right into the hole.

Other strokes, such as those through a swinging gate, require good timing. Since the ball isn't hit until you release the fire button, this is not as difficult as it could have been. But your power and aim have been locked in at this point, so you'll still find it frustrating. Golf is, after all, a game of patience, where only the cool and collected survive.

Documentation is minimal, yet it's substantial enough to teach you how to control the game. Scores are written to the disk so that on subsequent boots, they are going to be hanging out there for everyone to see. I suppose it is a necessary evil.

For graphics, sound, repeated playability, and challenge, I rate *Mini-Putt* very high. As for my best score to date, that's none of your business.

(Editor's note: We understand Erv's scores are also rated very high.)

—Ervin Bobo

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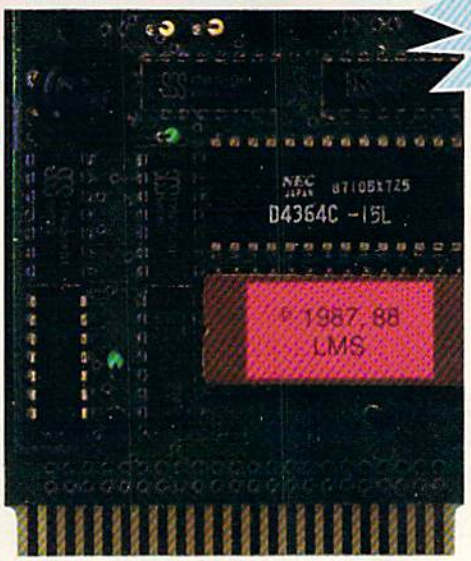

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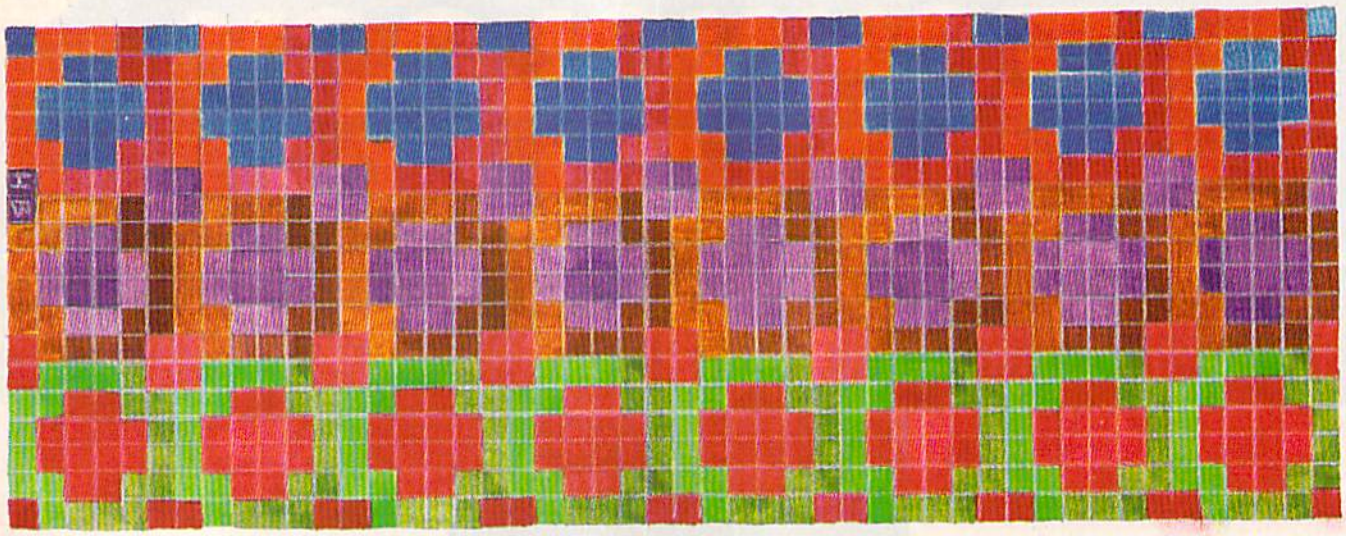


Mosaic

Jay A. Reeve

This strategy game for the 64 is no mere puzzle—it's a battle of wits. Several options for play should make this game an enduring classic. For one or two players.

The Sultan has called you—his most famous artisan—into his chambers. This isn't especially suprising since you're known throughout the land as the most talented creator of mosaics.

"Dear friend," the Sultan says, "your mosaics grace every room in my palace. However, my wizards and accountants have devised a machine which they claim can lay tile even better than you."

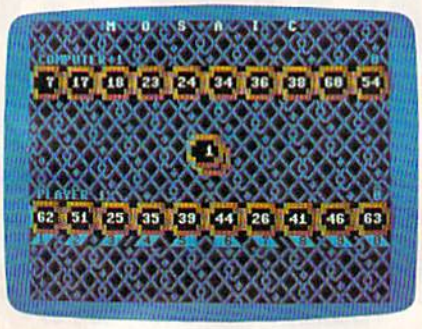
The Sultan has decided that a contest is in order. Turn for turn, you and the new machine will place your tiles, and the first one to create an aesthetically pleasing mosaic shall be declared the Sultan's official artisan.

You'd better win—you never did get around to learning any other trades.

"Mosaic" is a strategy game you can play against the computer or against a friend. Your goal is to place numbered tiles in order before your opponent. Although the rules are easy to learn, you won't find it easy to win. The wizards and accountants have created a truly ruthless machine.

Typing It In

Mosaic is written in BASIC with machine language subroutines. Carefully type it in and save it to tape or disk before running it.



"Mosaic" pits man against machine. It's the human player's turn, but the computer is closer to the numeric sequence that will win the game.

To play Mosaic, load the program and type RUN. Mosaic's option screen appears. You'll see the following list of options:

[1] Player vs. Player
[2] Player vs. Computer
[3] Player vs. Player vs. Computer
[4] Player vs. Computer vs. Computer

Options 1 and 2 are designed for two hands; options 3 and 4 are for three hands. Before selecting one of these options, you can press f7 on this screen to keep the computer player's tiles hidden during the game. This makes the game more difficult. Even if you look at the computer's tiles, it never looks at yours.

There are 64 tiles numbered 1–64. Each player is dealt 10 of the tiles at random, at the beginning of the game. Numbers appear directly below the tiles of the player who has the current turn. These numbers (1–9, then 0) let you select which tile you will replace. When it is your turn, a tile slides out across the screen. If you wish to use this one, press the key that corresponds to the tile you wish to replace. If you would rather try for a better tile, press the space bar, and a new one will slide out. If you press the space bar again, you forfeit your turn.

When you replace a tile, the one you trade in will be moved to the center of the screen. The next player can use that tile if he likes. Be careful that you don't trade in a tile your opponent can use to win the game.

See program listing on page 84.

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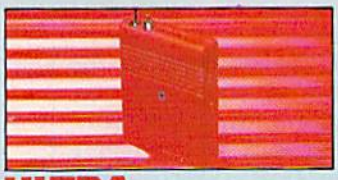

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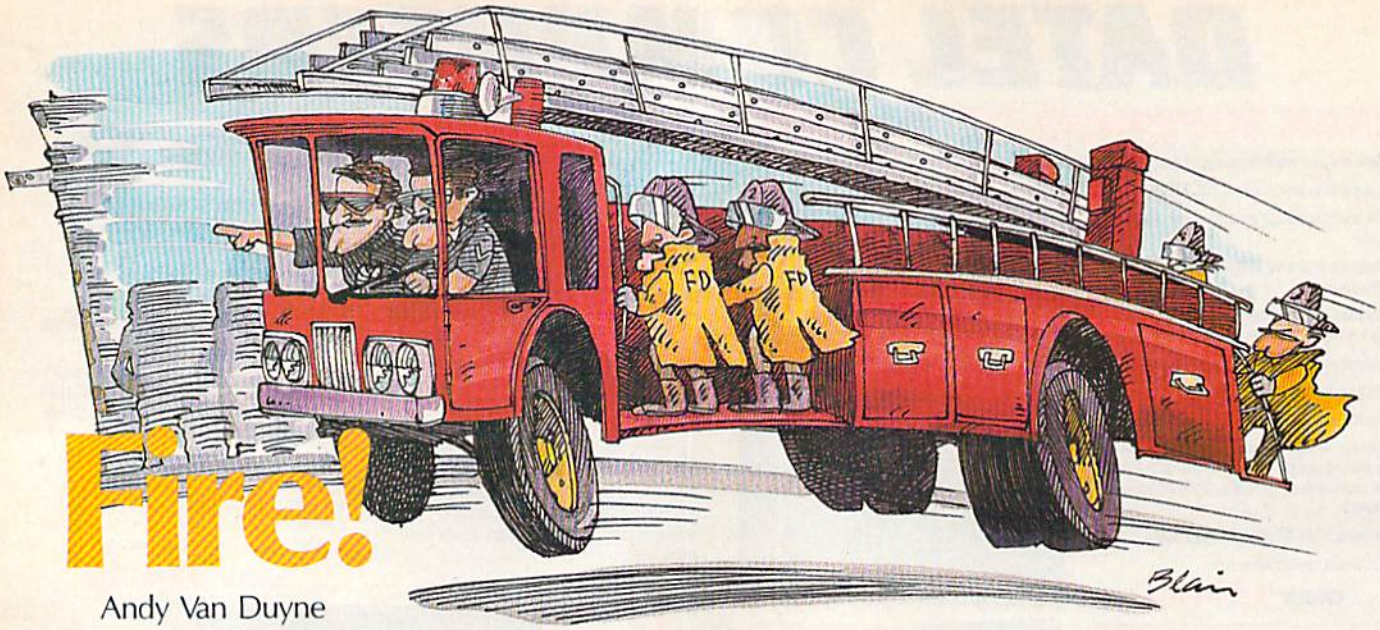


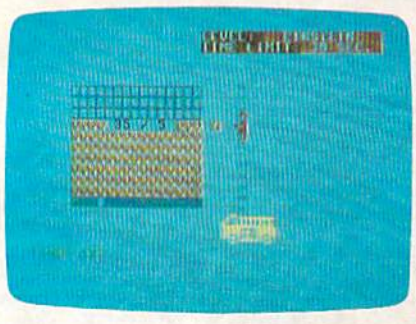
Fire!

Andy Van Duyne

A building is burning and the fire must be extinguished. But before you can use your hose to quench the flames, you must answer a math problem that appears on each burning floor. And because there's a time limit, speed is critical. This educational game lets children sharpen math skills and have some fun at the same time. For the 64.

This game makes skill development in math—addition, subtraction, multiplication, or division—a lot of fun. You control a fireman that must put out the fire in a burning building, one floor at a time. But before the flames on each floor can be drowned, you must answer a math problem correctly. It's a race against the clock, too. You can choose from three skill levels—beginning, intermediate, or Einstein—with each one giving you progressively less time in which to answer the problems and put out the fire.

"Fire!" is a BASIC program, so simply type it in, save a copy to disk, and type RUN. First, the program asks you to choose the type of math problem you want to work. You can choose either addition, subtraction, multiplication, or division. After making this choice, select the level of difficulty—beginner, intermediate, or Einstein.



Your math skill is the only useful weapon against the fire that threatens to burn down a building.

Each difficulty level allows you less time in which to put out the fire. At the beginning level you have 60 seconds, the intermediate level allows you 45, and at the Einstein level you have only 30 seconds to answer the problems and save the building.

Dousing The Flames

After choosing a difficulty level, you'll see the building, and then watch as it catches fire, while you hear the shrieks of the tenants. Next, a fire truck arrives on the scene and extends a ladder ten stories to the top floor of the building. The fireman climbs the ladder. When he reaches the top, you'll see the first math problem appear on the top floor, and a ticking clock will appear at the bottom of the screen.

If the problem is answered correctly, water comes out of the fireman's hose, drowning the flames. He then moves to the next lower floor where another math problem is presented, and so on down. If you answer incorrectly, you're notified and given another chance. If you do well, the residents of the building cheer. If time runs out, however, the building will burn down, leaving only the smoking cellar. After the game is over, you're given the option to play another game. If you decide to play again, you're given another opportunity to choose the type of problem you want to solve and the difficulty level.

Program Notes

Problems in each math category have the following parameters:

Addition	(0–9)	+	(0–9)	=	(0–18)
Subtraction	(1–18)	−	(0–9)	=	(0–9)
Multiplication	(0–9)	×	(0–9)	=	(0–81)
Division	(1–81)	/	(1–9)	=	(1–9)

Custom characters are used to represent the building and flames, while the fireman and fire truck are sprites. When the game is first loaded and run, there's a short delay while the normal character set is moved from ROM into RAM, and the new character definitions and sprite data are POKEd into memory.

Programmers may be interested in the technique in line 250, which fills the pitch array to play the tune. This formula creates the proper values for chromatic scales without having to go through the lists of pitches in the Commodore reference books. All you need to supply is one value for the lowest pitch you need. This array is later referenced by the string TU$, in which the odd characters refer to the pitch array, and the even characters control the note duration.

See program listing on page 88.

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Sometimes it's best to take a pass.

score—well, maybe it's time to take up bridge.

Introducing *Street Sports Baseball.*

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Bounce the ball off the chain-link fence, then go for the basket. Or power through a slam dunk.

But don't dribble in the oil slick. And for heavens sake, watch out for windows.

It's not like any basketball game you've ever played on a computer. But just like every basketball game you've ever played for real.

Notice that somebody just stole second base. Funny, it was here a minute ago.

ANOTHER HIT.

It's bottom of the ninth. Batter's 0 and 2. The first on your block.

After all, you'll have to cope with makeshift diamonds, bases made from spare tires and trashcans, bushes, rocks, even squealing cars.

Not to mention 16 neighborhood players. Each with their own personalities and skills in pitching, hitting and fielding. With the right combination, you could be the champs. With the wrong combination, the chumps.

You'll pick the place. The team. The positions. The strategy. And then, you'll be right in the middle of it all. With a split-screen view from above and up close.

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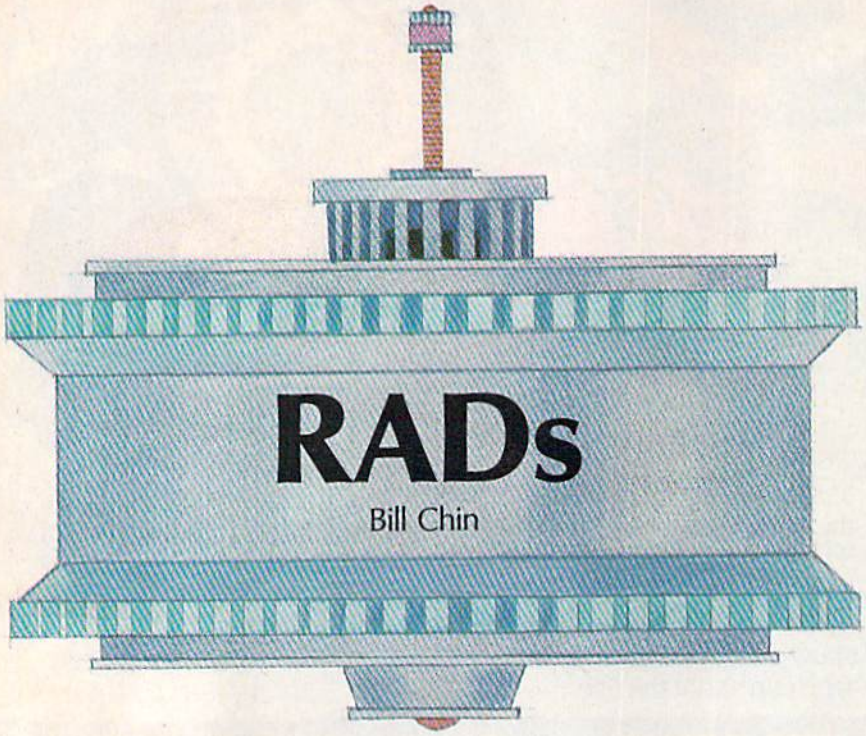


RADs

Bill Chin

It has been speculated that humans will someday rely on robots to do their dangerous work. In this game for the 64, that prediction becomes reality. For one or two players. Joystick(s) required.

It is the year 2023. You belong to the elite RADs unit, which is responsible for maintaining a galactic network of communication spindles. Whenever an ionic storm blows through, the communication spindles are spun out of alignment. You must realign the spindles to restore vital communication links—a very important and dangerous job.

Because this job proved to be too hazardous for humans to handle directly, Galactic Communications designed the rotating alignment droid (RAD). Each RAD is equipped with an efficient chemical motor for movement, and a rapid-fire stun gun for defense. Through the use of a remote computer console and a digital input device (your 64 with joystick), you must manuever a RAD through this dangerous territory in an attempt to repair all misaligned spindles.

Getting Started

To type in "RADs," you need to run "MLX," the machine language entry program found elsewhere in this issue. The starting and ending addresses for this program are:

Starting Address: 0801
Ending Address: 1A30

Once you've typed in and saved RADs, it can be loaded and run just like a BASIC program.

When you run RADs, a menu appears. Use the joystick in port 2 to select the mode you want. Push up or down to change the selection. Press *fire* to make the selection final.

Choose One Droid for one-player mode. If you wish to have two players working as a team, select the Droid Team option. The Competition mode is for two competing players. With one player, plug a joystick into port 2. The two-player modes require a joystick plugged into each port.

RAD Enemies

As with all games, this one has its share of enemies. Your main opponents in RADs are Space Spores and Hyper Spores—pulsating creatures with tentacles. Hyper Spores are similar to Space Spores, only they're faster and more aggressive. Space Spores can be stunned by a single shot, while Hyper Spores can take several hits. Contact with a spore that is not stunned can short circuit your droid—so try to keep your distance.

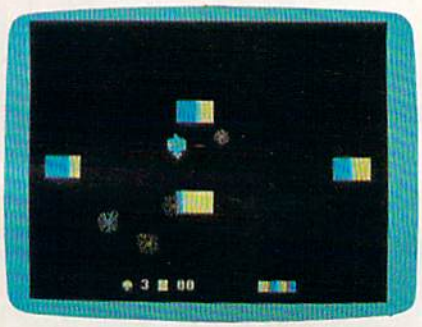
Bubbles, appearing as floating circles, are there to assist you. Hitting a Bubble with your stun gun releases tranquilizing gases that temporarily slow down your enemies.

Some of your most dangerous foes are Pods, which don't show up until you reach higher levels. A Pod looks like a Bubble, except it has a mark in its center. Striking a Pod with a shot from your gun causes the Pod to hatch and turn into a Hyper Spore. Pods also hatch when they collide with communication spindles. This collision disrupts the spindle, requiring you to realign it.

Operating A RAD

When the game begins, the RADs appear at the top of the screen; communication spindles are in the middle of the screen; and spores, pods, and bubbles are at the bottom.

You begin the game with four droids. To move a RAD, move the joystick in the corresponding direction. Moving off the left and right sides of the screen causes the droid to wrap around; moving above the top of the screen is prohibited; and dropping below the bottom of the screen destroys your droid (when short circuited by a spore, falling off the screen like this is unavoidable).



In the futuristic game of "RADs," one or two players use their droids to align important communication links in a hostile environment.

Pressing the joystick's fire button shoots a stream of multicolor shots. The direction of your shots is determined by the last direction in which you were moving, and you

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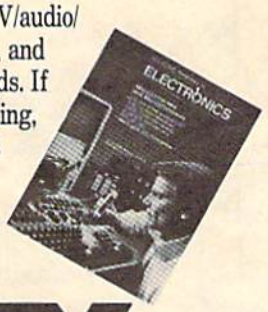

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may shoot to the left and right only. To pause the game, press the RUN/STOP key. Pressing a second time will resume play.

Aligning Spindles

Spindles are rotated by flying in front of them and pressing the fire button. Pushing left or right while holding the button down changes the direction of the rotation. To align a spindle, rotate it until it shows only one color and you hear a click. Each level is completed when all spindles are properly aligned.

The pattern located in the lower right corner of the screen indicates how many spindles of each color are needed. Alignment does not have to occur in the order shown; just make sure the total number for each color is correct.

Once all spindles are aligned with the proper number of colors, you move to the next level (RADs has nine different levels). Every level has more spindles than the previous one, and on the higher levels, Bubbles become scarcer, while Hyper Spores and Pods occur more frequently.

In Competition mode, you can ignore the designated pattern. The object is to align as many spindles in your color as possible. (A player's color is shown at the bottom of the screen, between the number of droids the player has left and his or her scrore.) A level is completed in Competition mode when all spindles are aligned.

The game ends when you run out of droids. In the two-player modes, players always begin with a droid at the start of a new level. So even if you lose all four RADs, you get another droid when the remaining player advances to a higher level.

When the game is over, another menu appears. Use the joystick in port 2 to select an option; select Continue to play a new game at the same level, in the same mode; choose Restart to begin the game from the initial menu; and choose Quit to return to BASIC.

Score

Your score is tallied at the end of each round. You get one point for each spindle you align. The score appears at the bottom of the screen next to the number of droids remaining.

See program listing on page 90.

User Group Update

Mickey McLean

This list includes updated entries to our annual "Guide to Commodore User Groups," which last appeared in the May and June 1987 issues.

When writing to a user group for information, please remember to enclose a self-addressed envelope with postage that is appropriate for the country to which you're writing.

Send typed additions, corrections, and deletions for this list to:

COMPUTE! Publications
P.O. Box 5406
Greensboro, NC 27403
Attn: Commodore User Groups

User Group Notes

The **Kosciusko Commodore Users Group**'s new mailing address is 312 E. Prairie, Warsaw, IN 46580.

New Listings

CALIFORNIA

Valley Commodore Users Group, P.O. Box 3228, Salinas, CA 93912

DELAWARE

Lower Delaware Commodore Computer Club (LDCCC), P.O. Box 5344, Nassau, DE 19964

FLORIDA

Port Orange Commodore User Group (POCUG), 1244 Thomasina Dr., Port Orange, FL 32019

NEW YORK

SpaceRay's Commodore 64/128 User Group, 20-23 20 St., Apt. 2C, Astoria, NY 11105

NORTH CAROLINA

Greater Onslow Commodore User Group, 910 Winchester Rd., Jacksonville, NC 28540

OKLAHOMA

Keystone Lake Commodore User Group, Rt. 3, Box 153-B, Cleveland, OK 74020

OREGON

The Rogue Valley Commodore Users Group, 2037 Boes Ave., Central Point, OR 97502

PENNSYLVANIA

Huntingdon County Hackers, P.O. Box 132, Mill Creek, PA 17060

Commodore Colony, 303 Old Airport Rd., Douglassville, PA 19518

WASHINGTON

Commodore Users of Grays Harbor, 1111 Fordney, Aberdeen, WA 98520

WYOMING

Cheyenne Association of Computer Enthusiasts (CACE), P.O. Box 1733, Cheyenne, WY 82003

Outside the U.S.

APO

Izmir Commodore Users Group, Box 2494, Izmir, Turkey, APO NY 09224

CANADA

Juan de Fuca C64/128 Users' Group, 978 Preston Way, Victoria, B.C., Canada V9B 3B9

MEXICO

South Eastern Users Group, Emilio Osorio Garcia, Col. 1ro de Mayo, Villahermosa, Tabasco, Mexico, C.P. 86190

PAKISTAN

Computer Users of Pakistan, 882/14, Federal B' Area, Karachi-38, Pakistan

Final BASIC

Larry Cotton

No, this is not one of those programs that adds commands to the 64. In fact, it's not a program at all. Instead, our "BASIC for Beginners" columnist, Larry Cotton, has decided to POKE fun (pun intended) at what seems to be a proliferation of BASIC-language enhancers. Sense of humor required.

Many programs have been written for the 64, which extend its built-in BASIC. However, no one BASIC enhancement ever seems to be enough. Some people want more graphics commands, some want sound, and still others want commands that simplify programming.

Presenting "Final BASIC"—a new programming language for the 64. Final BASIC should go a long way toward making your computing experience a much more enlightening one. These new commands not only enhance, they also overwhelm the 64's built-in BASIC and are presented here in alphabetical order.

The Commands

AND/OR: Logical instruction. If X is true AND/OR Y is true, then Z will probably be true, but not necessarily.

BRO: Opposite of SYS.

BUT: Argumentative logic term. Example: A BUT B POSS C means if A but not B is false or possibly true, then C will definitely, but not necessarily be greater than the sum of A and B. Also used with WHY and HOW, as in BUT WHY and BUT HOW.

DUMP ( ): Dumps contents of memory area specified in parentheses to unpredictable locations. *Warning:* Do not use during garbage collection.

EMU (*xxxx*): Immediate-mode command. Causes the 64 to emulate ordinary household appliances. Legal parameters: BLDR, MCWV, RFGR, STOV, TLPH, and TSTR.

EVER/BETTER: Used with IF/THEN. Example: IF A EVER = 5 THEN B BETTER = 12.

FAST: Converts BASIC programs to machine language in one pass and in under two seconds. Recognizes all BASIC commands (including Final BASIC's), automatically adjusts timing loops, and uses only half the disk space of the BASIC program it replaces.

GIGA: Adds one gigabyte of memory to the 64. *Caution:* Computer may require additional RFI shielding and possible rewiring of electrical circuits. Before invoking this command, wear eye protection and ground yourself.

GO (*xxx*): Similar to the GO64 command on the 128. Automatically makes the 64 emulate computer specified in parentheses. Legal three-letter parameters are: IBM, APL, ATR, TRS, and VIC.

HOW: A frequently used command by novices. Also see WHY.

HURRYUP: Increases speed of disk drive by factor of 12. Compatible with all disk commands. Example: LOAD "filename",8,HURRYUP. Completely eliminates head-knocking (drive's and yours).

JAB: Final BASIC's faster equivalent of the POKE command. Also saves typing one letter.

MAYBE: Similiar to BASIC's LET command, but even more optional. Example: IF X AND/OR Y = Z THEN MAYBE A = B: IF NOT THEN WHY NOT.

PLS: A command sometimes required before RUN.

POSS: Avoid using. Because of an internal bug in the 64 kernal, POSS occasionally crashes the computer.

READMAG: Command to read magazine program listings directly into computer. Requires folding page into a 5¼-inch square (3½-inch for 1581 drive owners).

SHUFFLE: Final BASIC's most well-documented command and fastest known unsorting algorithm. Randomly shuffles a previously sorted array of up to 65535 elements in under four nanoseconds.

SIT: Immediate-mode command. Sometimes used with FETCH, LIE DOWN, and SPEAK.

UNFORMAT: Resurrects accidentally formatted disks. The one command that's responsible for Final BASIC's $379 price tag.

WAIT: Same as in Microsoft BASIC, but more impatient.

WHY: A versatile command. Can be used by itself, like HOW, or in combination with logic instruction NOT, as in IF NOT and WHY NOT.

Sound And Graphics Commands

BEETHO: By use of this one keyword, the 64 plays Beethoven's Fifth Symphony and all its variations in all keys of the chromatic scale, simultaneously.

BWCOL: Screen-dump command. Prints the 64's screen (text or hi-res) on any black-ribbon dot-matrix printer in full color. Paper ($149 per sheet) sold separately.

DUBL: Doubles 64's resolution from 320 × 200 to 640 × 200 pixels, while converting text screen from 40 to 80 columns. Requires two monitors, side by side.

LISSEN: Voice-recognition command. Requires optional Kurzweil interface card, two Shure low-impedence cardioid stereo mikes, and a 2000-watt Carver pre-amp.

MORCOL: Increases 64's palette of 16 colors to 1 million (not counting mauve), all of which can be used simultaneously in highest resolution.

SCRIB: Free-form drawing command. Can be used with any input device: pencil, pen, crayon, magic marker, and so on. Interface cards sold separately.

VCRTV: By means of photoelectronic synthesis, reverberation of supernovas, and other mostly proprietary means, converts 64's resolution from 320 × 200 pixels to that of a TV or VCR. Must be used in conjunction with GIGA, DUBL, and MORCOL. ■

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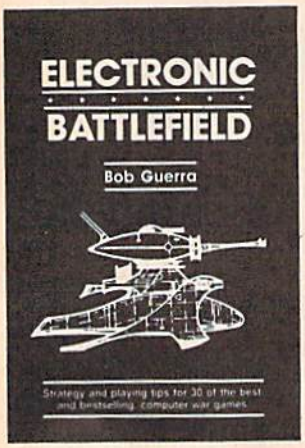

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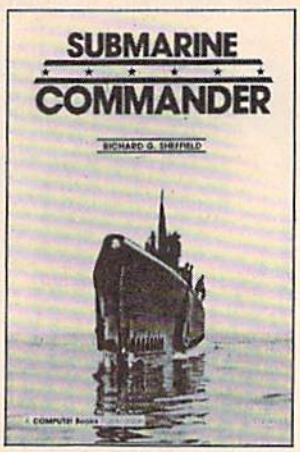

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More Than Just Pretty Pictures

Tom Netsel, Assistant Features Editor

Graphics Software Goes to Work

Graphics programs let 64 and 128 owners create all kinds of art on their machines. Here are some surprising and fascinating ways users are putting these programs to work.

Thanks to the many software packages that take advantage of the outstanding graphics capabilities of the 64 and 128, people who couldn't draw a straight line with a pencil can now create virtual masterpieces with their computers. With a few strokes of a light pen, mouse, or joystick, you can draw a picture, modify the image, move it, copy it, color it, and send it to a printer. Drawing is fun and entertaining, but computer art has a practical side as well. A variety of programs let users turn out sophisticated graphics that, until recently, would have required equipment costing thousands of dollars. These programs, along with a little imagination, turn a 64 or 128 into a productive tool that helps its owner communicate ideas, solve problems, educate students, and even earn a dollar or two.

Cat And Mouse Game

About five years ago, David Payne of Tyaskin, Maryland, started a newsletter to keep the scattered members of his family abreast of the latest happenings. Once or twice a month, he uses his computer to produce a newsletter that he sends to 24 friends and relations. Payne keeps the letter light and humorous, often poking fun at himself. He found that the graphics packaged with *The Newsroom* added to the humor.

Payne recalled an incident last winter when his house was invaded by mice seeking warmth. Payne's cat, Buddy, proved his worth by dutifully collecting the freeloading rodents and depositing them on the front porch—one each morning until they were eradicated. Payne wrote to let his relatives know what a champion mouser Buddy was, and included a rodent and cat graphic he found in *The Newsroom* to illustrate the story. Next to the story were the two pictures, and beneath them was printed: *Buddy 14 - Mice 0.*

Where's That Jammed Tape Drive?

William Hardnett, Jr. of College Park, Georgia, is a computer technician with Unisys. Engineers and technicians have to work on computers and peripherals installed at the company's various sites, but often they're not familiar with how the 50 or 60 different processors, tape drives, and printers are laid out.

"I wanted to have a diagram so any engineer or technician could walk in and locate a piece of equipment that needed servicing," Hardnett said. He used his 128 and *CADPAK-128* to lay out floor plans and diagrams of the computer systems at each of the company's sites. Now, technicians don't have to waste time finding equipment before they service it.

Gurus Of Graphics

Paul and Peter Hughes are twin brothers who help run their family's horse and rider business in Canton, Massachusetts. When the 25-year-old twins are not tending

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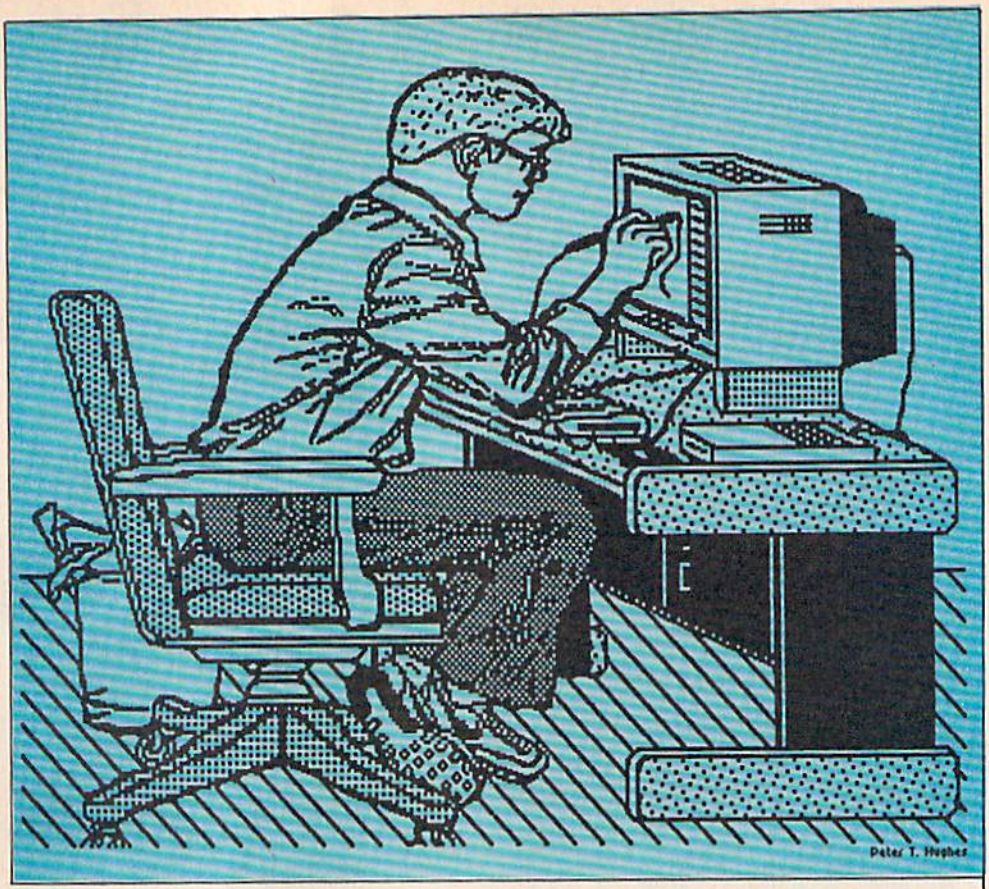
the 30 horses, giving pony rides, or teaching customers to ride, they offer a computer graphics service for area businesses.

They design brochures, fliers, invoices, and business cards for their own firm and for others. The brothers have two 64s, a 128, an Amiga, and dozens of graphics programs.

Paul is the system operator for the Graphics SIG on QuantumLink, and Peter is usually at his side when they log on. They also conduct graphics seminars at computer conventions and at Commodore user-group meetings.

As with many artists, the Hughes brothers employ a variety of graphics programs to produce the effects they want. One program may have a better spray-paint feature, while another may offer more useful brush sizes. No one software program can do it all. Many of their drawings begin with the *Flexidraw* package with light pen, and several examples of their work illustrate the program's instruction manual. Even though *Flexidraw* offers an advanced graphics and light-pen program, it still doesn't fill all their graphics needs.



A self-portrait by Peter Hughes, created with Flexidraw, *converted to* DOODLE!, *enlarged and optimized with* Billboard Maker, *and converted to* geoPaint *via* Graffix-Link.

"We often start with *Flexidraw* and sketch the design in hi-res for detail," Paul said, "but we can't use the full screen because the menu blocks the right side. So we move the picture into *DOODLE!* to take advantage of the full 320 × 200 pixel, hi-res screen."

After refining the details of the picture in hi-res mode, the brothers often load their drawing into another graphics program that uses multicolor mode, since the hi-res mode imposes limits to its color resolution.

After the color has been enhanced, the picture may be refined even more by loading it into *Billboard Maker*, where the image can be enlarged and optimized—the zigzag lines are smoothed.

Many times, there's a compatibility problem between graphics files. Some pictures created by one program can load directly into another, but often their formats have to be converted with a graphics utility, such as *Icon Factory* or *Graffix-Link*, before they can be loaded into another program.

"We have almost every graphics program for the 64 and the 128," Paul said. "We're always looking for the ultimate graphics package that has all the best features packed into one program."

If your budget or your interest in graphics won't allow you to own as many drawing programs as the Hughes twins, they recommend a British import that can be used by the first-time computer graphics artist and still be sophisticated enough for the more experienced computer user: *Advanced OCP Art Studio.*

Cost-Effective Graphics

Another person using *Advanced OCP Art Studio* is Bob Schweikert, owner of Pyramid Video Ltd., a video and film production company in Riverside, Illinois. Schweikert said he saw an ad for the program, bought it, and was "totally amazed at the beauty of being able to go with hi-res or multicolor screens in the same drawing package."

Many of Pyramid's customers have a need for cost-effective graphics, and Schweikert said the 128 is the best way to accomplish that task. "We've found that the Commodore can perform miracles if the software is there," he said.

Animation is very important to the company, and while the 128 itself is not conducive to animation, Schweikert said there are programs capable of doing it as long as he can create the initial graphics screen. He tried several drawing programs before buying *Advanced OCP Art Studio.*

One basic problem Schweikart found was that *Art Studio* was incompatible with *Moving Pictures*, the animation program normally used by his company. Schweikert wrote to Firebird, the program's U.S. distributor, and within a few days company officials were on the telephone offering solutions to Schweikert's problem. They located a public domain program that converted *Art Studio* files into a format that could be used with his animation program. Now the artists do

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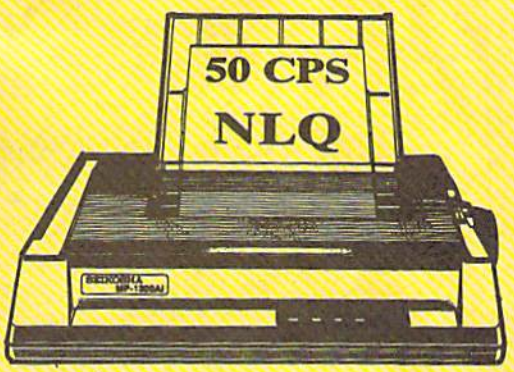

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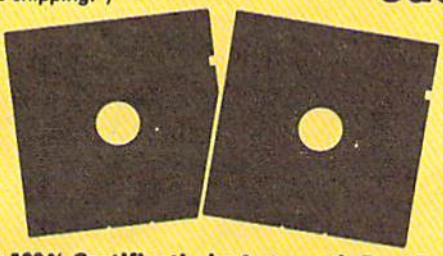

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the artwork on a 128, convert the format, and run them through the animation program.

"An independent producer may come in who is doing a video on how to clean teeth. He may want to see a tooth floating across the screen, settling into a technician's hand. This is what we use *Art Studio* for," Schweikert said. "We create the basic screens with *Art Studio*, then animate them with *Moving Pictures*.

Another graphics package Schweikert uses is *Screen F/X* from Solutions Unlimited. His company is moving more and more into animation, and he's impressed with the tremendous variety of special effects and quality of graphics it offers.

Bob Schweikert uses Advanced OCP Art Studio *for his video and film production company.*

"*Screen F/X* turns a 64 into a small broadcast studio, animation, and special effects system," he said. "We are starting to use *OCP Art Studio* screens with *Screen F/X* as the base for the superimposed graphics, and miracles are occurring. It beats anything out there for the Amiga."

Pyramid Video also creates logos for companies. The picture that comes out of *Art Studio* can be recorded directly onto video tape without any conversions. Corrections, changes, and improvements are a snap on a computerized image, saving the artist a lot of time and frustration, and saving the customer money. The final version can be dropped into a television commercial or promotional piece very easily. "We get absolutely perfect graphics at an infinitesimal cost compared to what it normally costs to create a logo," Schweikert said.

Digitized Images

Another businessman offering customers a variety of services is Cliff Bleakley. He operates Quick Response Secretarial Service in La Place, Louisiana. In addition to providing the usual typing and stenographic services, Bleakley offers graphics as well.

If a customer needs a picture of his product, or some other custom graphic in a report that Quick Response is preparing, Bleakley photographs it with his VHS video camera. The camera is connected to his computer through *Computereyes*, a digital acquisition system. After the black-and-white image has been digitized, Bleakley uses a *DOODLE!* graphics program to touch it up and enhance the image. With *DOODLE!*, he can color the digitized image, enlarge or reduce it, copy it, and add text before printing out the final version to the report.

Will I Need An Umbrella?

Phillip Salvatore is a security guard in Simsbury, Connecticut, who uses *DOODLE!* to help with his interest in meteorology. He uses his 128 to download weather maps from CompuServe. These NOAA national radar weather maps are updated every 15 minutes, and Salvatore downloads them over a six-hour period most every day. He uses the information with *DOODLE!* to draw his own weather maps, making his own weather forecasts. He has produced his own weather maps in this fashion for more than a year.

Clip Art

When the *GEOS* operating system arrived for the 64, it not only expanded the computer's capabilities, but it also expanded the business opportunities for a number of entrepreneurs. Susan Lamb, a commercial artist in Yuma, Arizona, ran a small business creating brochures and fliers for other firms, but she couldn't afford an expensive computer to handle the graphics programs she needed. She owned a 64 but was not doing much with it until *GEOS* gave her the tools she needed.

"It changed everything for me. It opened up a whole world for me because I could do so much with it." She used *geoPaint* to create her own clip art service. She now has disks filled with hundreds of useful drawings that can be incorporated into letters, reports, and newsletters. Lamb is planning more disks with holiday, sports, and religious themes, and she markets them through QuantumLink.

But How Will It Look Installed?

GEOS has also helped Terry Riley's business in Albuquerque, New Mexico. He uses *geoPaint* to create brochures for the medical equipment he sells. The manufacturer supplies expensive color brochures that illustrate the equipment's various intensive-care monitoring systems, but Riley provides custom notebooks showing exactly how the units will look when connected in his customer's hospitals.

"That's where *GEOS* is so beautiful," he notes. "I can run wires from one unit to another, and if they're connected by telemetry, I have little lightning bolts that look like radio waves, making it look as exotic as I want."

When people are spending between $150,000 and $400,000, a stack of brochures is one thing, but they want to know exactly what the system is going to do and what it is going to look like before they buy it and then have it installed. If Riley can produce a printout of a system designed to fit a customer's needs,

that customer knows Riley understands his problem and can provide him with exactly what he wants. That's a great advantage for a salesman in a competitive business.

Riley doesn't stop with custom brochures. He uses *geoPaint* to create his own letterheads. That means his invoices, statements, and letters all have the same letterhead. A commercial printer could do the same thing, but getting it printed on tractor-feed paper and having the right paper for invoices can be difficult, Riley said. This way, he has it all saved on disk, ready for when he needs it.

When he leaves work, Riley doesn't leave his computer at the office. He devotes a lot of his spare time to running a cub scout pack, and he finds *geoPaint* and *geoPublish* help with those activities. Whenever parents volunteer to help with scouting programs, Riley likes to present them with certificates of appreciation. He designs and prints his own certificates.

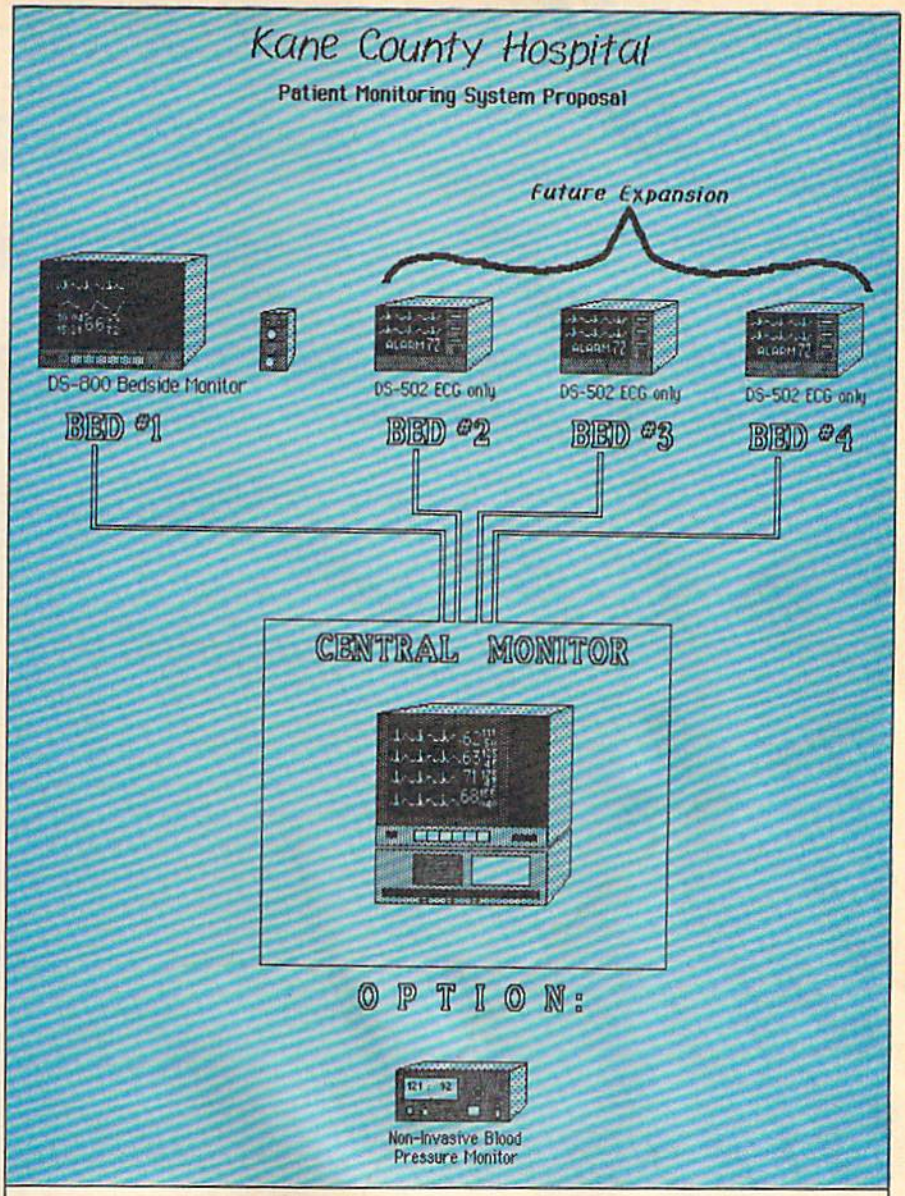
The parents like to get them, and the Scouts are proud when their parents get the recognition. It also makes them quicker to "volunteer" their parents for the next function, Riley said.

A Learning Tool

Another user working with graphics programs and children is Carol Getman, a speech and language therapist in Mineral Point, Wisconsin, who works with children suffering from a variety of learning disabilities. Some of her students have vocabulary or eye/hand motor problems, while others have difficulty differentiating between left and right or up and down. Some children cannot follow more than one instruction at a time.

While most people take these simple acts for granted, children who have not developed these skills face severe learning difficulties in life and in school. Getman finds computer graphics programs can be a valuable tool for helping her students develop these necesary skills.

She uses *Blazing Paddles* and other programs with a touch tablet for some of her lessons. After she explains the program and demonstrates its use, she lets the children have fun drawing, calling up earlier pictures that have been saved or pictures from *The Print Shop* collection. They send the pictures to a printer, color them, cut them out, and paste them in notebooks they each keep.



Terry Riley uses geoPaint *to create customized displays for use in his medical equipment sales business.*

Just using a drawing tablet can be a lesson itself. It takes some coordination to use the tablet and stylus while controlling an image on a monitor. The pictures hold a child's attention while he or she learns, making the sessions seem more like fun than therapy.

While the activities may sound simple, mastering these skills can mean an important victory for a child with a learning disablilty. The teacher explains the program and the child listens and learns to follow directions. The students guide a cursor between menus and drawing screens, developing their motor skills and coordination. Finally, they get copies of their drawings and put them on display in their notebooks. The youngsters are proud of the pictures they've made, and it gives them a feeling of accomplishment.

A graphics program in Carol Getman's classroom does much more than just help students with their drawings. "It takes care of their self-worth and confidence while covering auditory and visual skills at the same time," Getman said. That's quite an accomplishment for a computer program, especially one primarily designed to draw pretty pictures.

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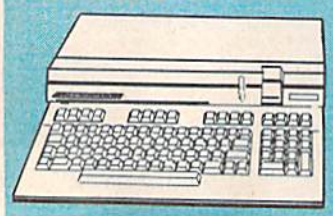

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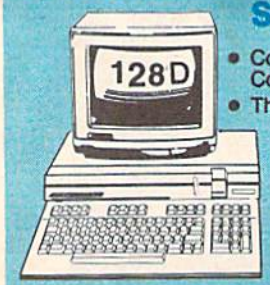

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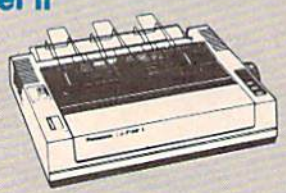

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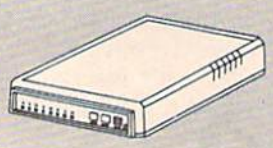

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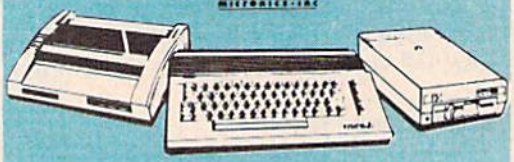

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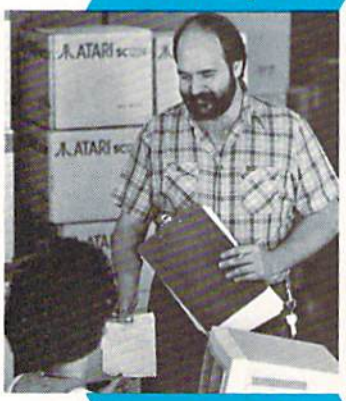

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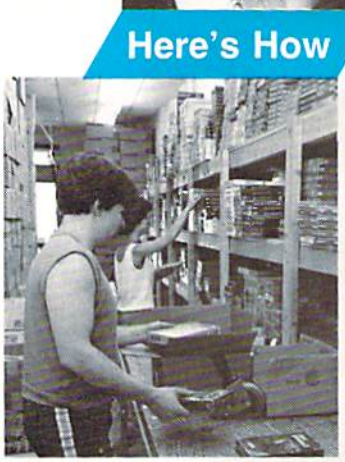

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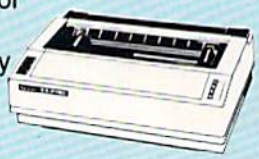

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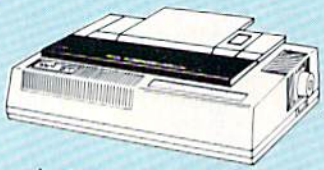

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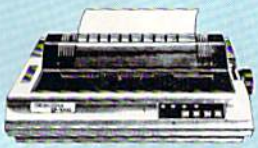

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I Dream Of Intelligent Machines

Fred D'Ignazio
Associate Editor

If every instrument could accomplish its own work, obeying or anticipating the will of others. . .If the shuttle could weave, and the pick touch the lyre, without a hand to guide them, chief workmen would not need servants, nor masters slaves.—Aristotle, Politics

The Singing Shower

I had a dream the other night. I dreamt that I was lying in bed, sound asleep. Suddenly the bed started vibrating. "It's morning!" it sang. "Get outta bed, you sleepy head." A moment later it tilted to the right and tossed me on the floor. "It's the early bird that catches a worm," it said.

I got off the floor and stumbled into the bathroom to take a shower.

"Hi, guy!" the shower greeted me. "Steamy hot, as usual?" Water poured from its spout and clouds of steam filled the room. As I soaped up, the shower sang songs from MTV and the Lawrence Welk Show. "It has a nice voice," I remember thinking.

Larry The Lamp

As my dream continued, I went about my day, constantly bumping into machines that talked, sang, and treated me as if I were King Farouk. The machines even had names! Larry the Lamp called to me as I came into the living room, then clicked itself on. Frank the Fireplace roared into life, sending a warm glow around the room and quite a few sparks up the chimney. "Come sit on me," begged Cameron the Couch. "No, me," pleaded Chadwick the Chair. "Don't fight, guys," I said, taking a seat on the couch. "Cameron asked first so I'll sit on him for a few minutes. Then I'll switch to you, Chadwick. Be patient, and you'll each get a turn."

Books That Read Themselves

At first, I enjoyed the dream. It was kind of fun having beds and showers and couches treat me like something special. But as the dream went on, it subtly began to change into something slightly sinister.

It was fine having things help me with *physical* labor, like slices of bread that toasted and buttered themselves, and trash cans that sprouted legs and ran out the back door whenever they heard the garbage truck. But this help extended into the *mental* arena, too. And there I found it a little less welcome.

When I sat down to read a book, it began pouting and slamming its covers shut because I wouldn't let it read itself aloud. "But I want to see the words on the page," I said, trying to pry the covers open. "What a spoilsport," whined the book. "It's much more fun to let *me* do the reading myself."

I fled from the book and sat down at my Commodore computer, thinking I might write my monthly GAZETTE column. I stretched and limbered up my fingers and stared at the screen for a few minutes, making mental notes about what I would write. Suddenly the keys began clicking, and words appeared on the screen. The computer was writing *my* article! "I DREAM OF INTELLIGENT MACHINES," it wrote. "By Fred D'Ignazio." "Don't you think you should let me do that?" I asked. "Not really," said the computer (whose name, by the way, was Carla). "This is my job." It continued typing: "If every instrument could accomplish its own work, obeying or anticipating the will of others. . . ."

"Oh, phooey!" I said, getting up from the computer. "It'll probably be a dumb article." I went back and sat on the couch. All at once, the chair started screaming. Startled, I jumped into the air. "You sat on Cameron twice!" it cried. "You promised to sit on me next. Not fair! Not fair!"

The last thing I remember in the dream was trying to run out of the house but being held prisoner by the door until it finished telling me a "Knock, Knock" joke.

Mind Over Matter

This was a silly little dream that suddenly went out of control. But it bears some resemblance to the real world—the world of tomorrow where our children will be spending most of their lives. As in the dream, it's OK to have machines act as labor-saving devices when that labor is mostly physical. (Even here there is a cost in terms of our physical health, but we can at least compensate by jogging, kite flying, and aerobics.) But what happens when the machines, all in the name of being our faithful servants, take over our *mental* activities as well? Just as our bodies have suffered from the industrial revolution, might not our minds suffer from the computer revolution?

"Of course not," say all you computer educators out there. "We are teaching our children to use the computer as a mind amplifier, not a mind dampener." I can see this, and I wish you well. But I think you might be fighting a losing battle. The mainstream thrust in the history of technology has been in devising new tools to automate human activities. Thinking is certainly one of those activities. And for the first time we have a tool that shows the potential to apply itself zealously to this task.

I can just picture the last few words on the computer screen in my dream: "...the last few words on the computer screen in my dream," it said. "The End."

BASIC for beginners

The Random Function

Larry Cotton

This month, we'll look at my favorite BASIC function: RND. RND is one of the functions that separates computers from most other machines. It stands for RaNDom, and gives the computer the gift of unpredictability. We'll also work with the INT function and introduce some simple math.

RND in its simplest form causes the computer to generate a random number between 0 and 1 (but not 0 or 1). Type in this one-line program and run it:

```
10 PRINT RND(1)
```

Run the program several more times and observe the results. The computer generates more (and most likely different) numbers between 0 and 1, each usually nine or ten decimal places long.

Rarely, you'll see a number with a capital *E* and a negative number after the decimal point. In a case like this, the computer is either generating numbers very close to zero, or it's leaving off a string of leading zeros.

Actually, the computer is too logical to produce a truly random number. The RND function returns what is called a *pseudo* random value. It takes a given *seed value* and plugs it into a formula to generate the "random" value. If you knew the algorithm and seed value, you could predict the value that RND would return. However, the formula used is sufficiently complex that the results closely approximate a random distribution.

A Random Number From 1 To 10

When we have the computer generate random numbers, we rarely want numbers between 0 and 1. Therefore, we need to specify a range within which the random numbers must fall.

Let's say we want to randomly generate all the whole numbers from 1 to 10, including 1 and 10. To simplify this task, let's break the process down into a series of small steps. Here's how to start:

```
10 A = RND(1)
20 PRINT A
```

If you type in and run this, the variable A becomes a fractional value between 0 and 1.

The next step involves a little math. We need to tell the computer to add and multiply. The mathematical operators we need to use are + and *. Both operators are found on your computer's keyboard. Note that the computer uses an asterisk for a multiplication sign.

Now let's multiply by 10 (our upper limit) the random number the computer generates.

```
30 B = 10 * A
40 PRINT: PRINT B
```

In line 30, we multiply A by 10, setting B equal to a random number between 0 and 9. In effect, the decimal point shifts one notch to the right. Line 40 prints the value of B.

We're getting closer to our goal, but we're still dealing with a fraction, not an integer. Let's get rid of the fractional part of the number with BASIC's INT function.

```
50 C = INT(B)
60 PRINT: PRINT C
```

In line 50, INT lops off all digits to the right of the decimal point, leaving the INTeger portion of the number. C now becomes the integer value of B. (Note that INT does not round off fractions; it just leaves whatever whole number was there.)

Since we are left with a program that produces random integers between 0 and 9, all we have to do now is add 1.

```
70 D = C + 1
80 PRINT: PRINT D
```

Finally, the program generates random numbers from 1 to 10 (including 1 and 10). Line 80 prints the result. If you wish, you may compress this process into one program line. Type NEW and enter this line:

```
10 PRINT INT(RND(1)*10)+1
```

As you can see, this line accomplishes the same thing as our previous program: It takes the integer value of the random function multiplied by 10 and adds 1.

Lower And Upper Limits

To precisely control the range of random numbers you plan to generate, it's a good idea to add a line which contains two variables, L and U, which represent the lower and upper limits. We must also modify the random statement to accommodate these two new variables. As an example, enter the program below:

```
10 L=1:U=10
20 N=INT(RND(1)*(U-L+1))+L
```

As written, this program creates random numbers between 1 and 10. By changing the value of L and U in line 10, you can select the range of random numbers produced.

A common demonstration of the RND function is to simulate the flipping of a coin. For example:

```
10 L=1:U=2
20 N=INT(RND(1)*(U-L+1))+L
30 IF N=1 THEN PRINT "HEADS"
40 IF N=2 THEN PRINT "TAILS"
```

Lines 10 and 20 are the same as in our lower-and-upper-limits example, except that now our lower limit is 1 (for heads) and our upper limit is 2 (for tails).

With your recently accumulated knowledge of BASIC, you should be able to write simple programs which take advantage of the RND function. You can use RND to simulate the rolling of dice, or to randomly determine the events in an adventure game. Next month, we'll explore RND in even more depth.

But Not Both

Todd Heimarck
Assistant Editor

Imagine a small child named Norman. His mother puts a cupcake on the kitchen table and leaves him alone in the room for a moment. What happens to the cupcake? Either Norman eats it or he doesn't.

You can't have a cupcake and eat it, too. It's one or the other, but not both. The phrase *but not both* distinguishes an EXCLUSIVE OR from the more common inclusive OR. In a line such as IF (A=13) OR (B<C) THEN D=15, the OR is inclusive; the first statement or the second *or both* may be true.

To make sure we're working with both ORs in the water, call the inclusive or *OR*, and call exclusive or *EOR* (pronounced like *Eeyore*, the character from *Winnie the Pooh*). Machine language has an EOR function. The 128 has XOR.

Although the 64 doesn't support EOR, you can simulate it. To EOR the variables A and B, assigning the result to C, use any of the following lines:

```
C = (A OR B) AND (NOT (A AND B))
C = (A OR B) AND ((NOT A) OR (NOT B))
C = NOT((A AND B) OR ((NOT A) AND (NOT B)))
```

A Curious Property Of EOR

Some functions are reversible; some aren't. Addition and subtraction, for example, are complements.

Figure 1 illustrates the differences between AND, OR, EOR, and NOT. Note that AND and OR aren't reversible. If C and B are both 0, the original state of A can't be determined. It could have been 0 or 1.

The EXCLUSIVE OR function is perfectly reversible. In fact, EOR is its own complement. If you begin with C = A EOR B, then it's also true that A = B EOR C and B = C EOR A. This is the EOR triangle; if you know two of the numbers, you can always calculate the third. Figure 2 illustrates that if you start by EORing 169 with 115, the answer is 218. EOR 218 with 115, and you get back the original number, 169.

Some Applications

Let's say that, for some reason, you want a variable to toggle between the values of 169 and 218. As you can see from Figure 2, you could write a single subroutine that EORs the variable with 115. It would convert 169 to 218 and vice versa.

The EOR function makes encoding and decoding files easy. First, you and a friend agree on a password such as *pomegranate*. Next, you write a program to read the text file byte-by-byte. Take the ASCII value of the first character and EOR with the ASCII value of *p*. Send that character out to a second file. EOR the second byte with *o*, and so on. To reverse the process, EOR with the same code word.

A third application is a method to save memory. Say you've got a large number of strings stored in no particular order. Each string has two pointers: one forward, one back. This is called a *linked list*.

AND		=
A	B	C
0	0	0
0	1	0
1	0	0
1	1	1

OR		=
A	B	C
0	0	0
0	1	1
1	0	1
1	1	1

EOR		=
A	B	C
0	0	0
0	1	1
1	0	1
1	1	0

NOT	=
A	C
0	1
1	0

Figure 1

	decimal	hex	binary
	169	$A9	10101001
EOR	115	$73	01110011
	218	$DA	11011010
EOR	115	$73	01110011
	169	$A9	10101001

Figure 2

To move forward through the list, retrieve the pointer to the beginning of the list, which might send you to the name *Adams*. *Adams*, in turn, is linked to the second name, *Bell*, which points to *Calhoun*, and so on. *Bell* has a forward pointer to *Calhoun* (say it's memory location 14931) and a backward pointer to *Adams* (location 12571).

Instead of two pointers of two bytes each, combine them with EOR. When you EOR 14931 and 12571, the answer is 2888, which contains enough information to move forward or back. Let's say you're going forward from *Adams* to *Bell*. You know that *Adams* was at location 12571 and that the magic number is 2888. EOR them together, and you'll know that the forward pointer is 14931. Later in the program, you're running backward through the list, moving from *Calhoun* to *Bell*. The previous address was 14931, and *Bell*'s code is 2888. When you EOR the two numbers, the answer is 12571, the address of *Adams*. As long as you know two parts of the EOR triangle, you can find the third.

I'll exit with a puzzle for ML programmers. You have two memory locations called FIRST and SECOND. A third location called MASK holds the value 224. What happens when you LDA FIRST: EOR SECOND: AND MASK: EOR SECOND? Do it in binary and separate the result into the top three bits and the bottom five bits. This technique was originally discussed in "An Interesting Fragment of Code" by the game designer Chris Crawford in the June 1983 issue of COMPUTE!.

the geos column

This month, we'll answer a few of the questions that have been filling the* GEOS *mailbag.

When using *geoWrite* 1.3, I have difficulty "undoing" two commands. First, when I try to get rid of a *geoPaint* picture placed within my document, I have to add some garbage text before the picture, drag the cursor to select a range from the garbage text to just beyond the picture, and then use the Cut option from the Edit menu to erase the picture (thus leaving an undesirable photo-scrap file on my disk). Second, I'm not able to get rid of a forced page break without clipping out all of my text and then pasting it into a whole new file. Are there easier ways to undo these commands?

Jim Firmiss

The best way to delete a geoPaint *image or a page break is to place the cursor immediately after the item to be erased and press the DEL key. The placement of the cursor is critical. To place the cursor directly after a* geoPaint *image or page break, move the cursor to the leftmost position on the line following the item to be deleted.*

Once you press DEL, a geoPaint *image is immediately removed. In the case of a page break, however, a dialog box appears, asking if you want to delete the last character of the previous page. All this dialog box is really asking is if you want to delete the page break or not. Click OK if you do want to erase the page break, click Cancel if you don't.*

One of my kids used *geoPaint* on my *GEOS* system disk and now there is only 3K of storage left on the disk. As a result, every time I try to run a program, I get the message "Warning: disk near full. Please delete files to continue." When I try to delete something, I'm told that files cannot be deleted from a *GEOS* system disk. How do I get out of this seemingly impossible situation?

Steve Beatty

First, you should carefully read Chapter 1 in the GEOS User's Manual*—specifically the section on making a work disk. Following the instructions, make a backup (a copy of) your applications disk. With early versions of* GEOS*, you are given only a system disk. In this case, follow the instructions to copy your system disk. This copy becomes your work disk.*

You can make additional work disks by copying the disk that you just made. The system disk is for booting GEOS *only. Never run* GEOS *applications such as* geoPaint *from your system disk; this is the purpose of the work disk.*

Many people spend hours fine-tuning their work disks, making sure that the disk contains just the right mix of fonts and desk accessories to complement a particular application. The main consideration here is to make sure that you leave enough room on your disk for your data files. Data files are created every time you open an application, and without room on the disk for them, the application does not run.

Chapter 2 of the user's manual has a good section called "Tailoring a Work Disk" that explains how to delete unnecessary files from a work disk. Instead of telling you what files to delete, here's a list of files that every work disk should contain:

DESKTOP
An Application such as geoPaint
A printer driver for your printer

To spice up your work disk, you'll probably want to include some desk accessories and fonts. On a geoWrite *work disk, for example, you'll want to include several fonts and the* Text Manager *desk accessory. So that you can set the time, it's always a good idea to include the* Preference Manager *or* Alarm Clock *desk accessory. In any case, try to leave at least 25K of free disk space for program data.*

Starting with GEOS *version 1.3, Berkeley Softworks added a safety feature to all of its system disks: You can no longer simply drag files into the Waste Basket to delete them. This is not true of work disks, just the system disk. This way, you cannot inadvertently delete important files, such as GEOS BOOT.*

To delete a file, first you must select the file, choose the Info option from the File menu, click on the write-protect box so that it appears empty, and then close the Info window to return to the deskTop. (You must do this to any file that is write-protected, whether it's on a system disk or not.) Secondly, move the file onto the deskTop below the Disk Notepad. Lastly, move the file from the deskTop to the Waste Basket. By placing the file on the deskTop first, you are allowed to delete files from the system disk. Use this information wisely.

Is it possible to write a BASIC program that automatically reboots *GEOS* when it ends?

David Engleman

The normal method of rebooting GEOS *from BASIC is to tap the RESTORE key, so you can always end your BASIC programs with the message PRESS RESTORE TO RETURN TO GEOS. It is possible, however, to have the program initiate the reboot. To do so, simply end your program with the command SYS PEEK(792)+PEEK(793)*256. This SYS reads the nonmaskable interrupt vector in order to jump to the same routine that is executed when the RESTORE key is pressed.*

In order for the reboot to be successful, the GEOS *system disk must be in the disk drive. If you own one of Commodore's new RAM expansion units, you can configure* GEOS *to do a RAM reboot. This way, the system disk is not required, and reboot is almost instantaneous.*

simple answers to common questions

Tom R. Halfhill, Staff Editor

Each month, COMPUTE!'s Gazette tackles some questions commonly asked by Commodore users. If you have a question you'd like to see answered here, send it to this column, c/o COMPUTE!'s Gazette, P.O. Box 5406, Greensboro, NC 27403.

Q. I own a Commodore 128 and a Commodore 1902A monitor. I have seen television tuners that you hook up to monitors to turn them into TVs. Do these devices work well, and do they in any way ruin the monitor's resolution?

A. The television tuners you've seen are an ideal way to make a computer monitor serve double-duty as a TV set. Some are available for under $100, which means you can have a color TV for the price of a black-and-white portable.

For readers who are unfamiliar with these outboard tuners, they are small boxes that receive TV signals and feed them to a monitor. In effect, an outboard tuner is a TV set without a built-in screen or loudspeaker. You connect your VHF/UHF antenna or cable service to the tuner, then plug the tuner into the composite video and audio inputs on the computer monitor. The monitor then acts as the tuner's screen and loudspeaker. The tuner has a channel selector so you can receive broadcasts or cable programs and some even have remote control.

The quality of the picture and sound depends on the quality of the tuner. If the outboard tuner is comparable to a decent-quality tuner section built into a regular TV, the picture quality will be very good. In fact, the combination may well outperform an ordinary TV set, because computer monitors generally have exceptionally sharp screens.

Outboard tuners will in no way harm your computer monitor. The monitor can't tell the difference between a computer video signal and a TV signal; it just displays what it receives.

Another way to turn a monitor into a TV is to plug a videocassette recorder (VCR) into the monitor. Every VCR contains a TV tuner, too. Simply connect the VCR's video and audio output jacks to the monitor's composite video and audio input jacks. Hook up the antenna or cable service to the VCR as usual, then tune in a channel on the VCR. If the VCR has a good tuner, you'll get a good picture on the monitor.

The only disadvantage to this approach—compared to a conventional TV-VCR combination—is that you won't be able to watch one TV show while taping another. The reason, of course, is that two independent tuners are required for simultaneous taping, and a VCR-monitor combination has only one tuner. This is a minor consideration, however.

Q. My wife and I spend up to six months a year traveling in our trailer. Can I carry my Commodore 64, 1541 disk drive, and Okidata 120 printer in my trailer without damage? I know the disk drive needs the head vibration protector card and the printer needs the cardboard printhead retainer. Other than securing them so they don't fall or get thrown, is that all that's necessary? Also, can a portable generator be used to power this equipment? If so, do I need more than the standard surge protector I already have?

A. This is a more common question than would first appear. Although not many people enjoy the luxury of traveling six months a year, many people *do* transport their computers fairly often—whether they move to a new abode, or haul the system to a user group meeting, or carry it to work or school. Plenty of computer devices, especially disk drives, are damaged in the process.

The best safeguard is to pack the equipment in the original boxes. Almost everything these days comes packed in form-fitting plastic foam that's highly shock-resistant. If the original packing protected the equipment throughout the arduous voyage from its Far Eastern manufacturer—a voyage typified by rough seas, bumpy roads, aggressive forklift operators, and indifferent freight handlers—it'll probably take anything you can dish out.

If you've already thrown away the original packing, the next best alternative is to duplicate it the best you can. You can buy or scrounge hunks of plastic foam, cut them to fit your components, and secure them in cardboard boxes. Or you can bury each component in a box of plastic foam "popcorn," a confetti-like packing material that's also pretty common.

In addition, you should protect the equipment from temperature extremes. Hot and cold temperatures cause expansion and contraction. In combination with shock and vibration, this can make vital parts work loose.

As for powering a computer with a portable electric generator, we have no experience with this but are a little wary of the idea. Computers are more power-sensitive than other home appliances, and they could be damaged if the generator isn't equipped with line conditioners to prevent surges and voltage fluctuations. Most surge protectors guard against sudden voltage spikes, but not gradual fluctuations.

Perhaps the best solution for people who travel a lot is a battery-powered laptop computer. These have become very sophisticated lately. However, none of them can run your Commodore 64 software.

Function Key Magician

J. Basil Cox

The most powerful function-key customizer we've published for the 64, "Function Key Magician" lets you design and save 16 function-key macros. It takes only the press of a function key (or a function key in conjunction with the SHIFT, ConTRoL, or Commodore logo key) for your chosen phrase to appear. A disk drive is required.

When you're working with a computer, you tend to type certain phrases over and over. For instance, how often do you type LOAD"$" ,8, LIST, RUN, and PRINT? "Function Key Magician" lets you assign each of these phrases (and others) to the four function keys. In all, 16 macro keys are available.

Using "The Automatic Proofreader," type in Function Key Magician, and save a copy of the program to disk before running it.

Function Key Magician defines all 16 function-key combinations in lines 40–190 in the program. You can use these default macros, or define your own. If you choose to make your own, remember that the RETURN character is CHR$(13) and the quotation mark is CHR$(34).

A Trial Run

Load the program and type LIST 40–190. We'll change one of the key definitions. Move the cursor to line 180 and change the line so it reads as follows:

```
180 F$(15) = "LIST40-190" + CHR$(13)
```

This line will list line numbers in the range 40 to 90 in any BASIC program that's in memory. Now type RUN. The program defines the keys. It then asks if you would like to save the new definitions to disk. If you choose not to, the program ends.

If you choose to save the function definitions, you'll be prompted for a filename. Type in a name, such as TEST FUNCTION, and press RETURN. Your key definitions are saved to disk and the function keys will be activated. After you've defined your function keys, you don't have to load Function Key Magician to use them. Whenever you want to load your key defintions, type LOAD"TEST FUNCTION" ,8,1. Then type NEW. To activate your function key definitions, type SYS51200.

Key Definitions are accessed in four ways. The following table shows how to get all 16 key macros.

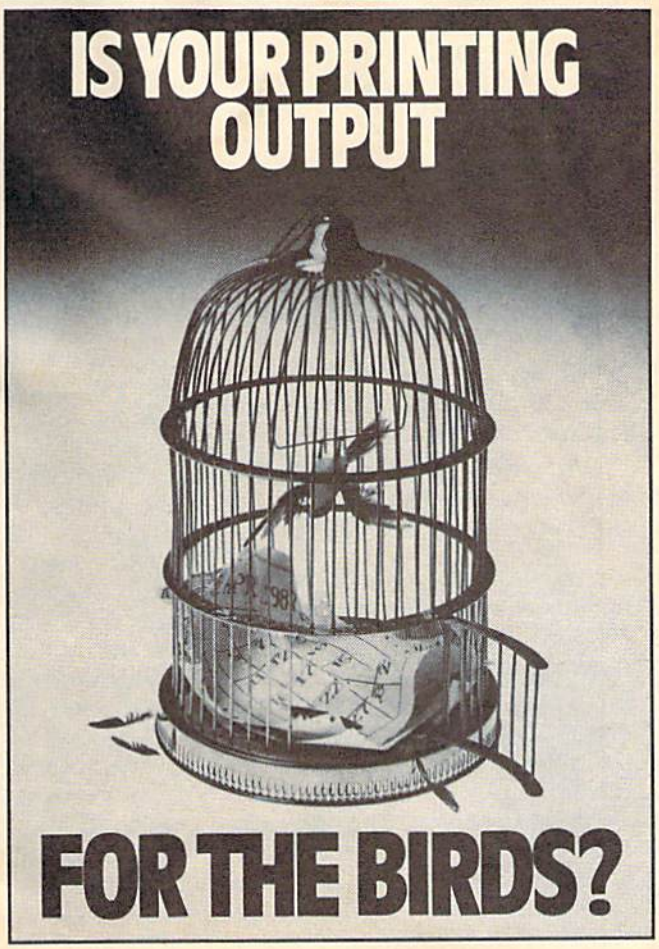
	f1	f3	f5	f7
Function key	1	2	3	4
With SHIFT	5	6	7	8
With ConTRoL	9	10	11	12
With logo key	13	14	15	16

The numbers specify the macro defined in the program. For example, line 60 in the program looks like this:

```
60 F$(3) = "PRINT" + CHR$(34)
```

This is macro definition number three. By looking up the number 3 in the table, you'll find that this string will appear whenever you press f5. After you've customized the program, you might want to make a chart showing what all 16 function-key combinations do.

See program listing on page 89.



Disk Drive Hints

If you've discovered a clever time-saving technique or a brief but effective programming shortcut, send it to "Hints & Tips," c/o COMPUTE!'s Gazette. If we use it, we'll pay you $35. We regret that, due to the volume of items submitted, we cannot reply individually to submissions.

Using The 1571 With A 64

Frank James

Normally, the 1571 is considered a 128 drive only. As many 64 owners are finding out, the versatile 1571 has a lot to offer the 64 as well. Here are some useful tips for taking advantage of the 1571's different modes using a 64.

Upon power up or reset, the 1571 defaults to 1541 (single-sided) mode. By entering the following line, you can switch to 1571 (double-sided) mode:

```
OPEN 15,8,15,"U0>M1":CLOSE 15
```

In this mode, you can format both sides of a disk with the command

```
OPEN 15,8,15,"N0:diskname,id"
  :CLOSE 15
```

providing 1328 free blocks of disk space. In this mode, the drive reads and writes to both sides of the disk.

To switch back to normal 1541 mode, enter this line:

```
OPEN 15,8,15,"U0>M0":CLOSE 15
```

While in this mode, only the bottom side of the disk may be accessed. Another command,

```
OPEN 15,8,15,"U0>H1":CLOSE 15
```

causes the top read/write head to become operational. Now, only the top side of the disk may be accessed. This is the opposite of how a normal 1541 works. If you use the DOS wedge, you may enter these commands much more easily. For example, to switch to 1571 mode, simply enter @U0:M1.

The bottom side of a disk contains tracks 1–35, while the top side contains tracks 36–70. Files stored on tracks 1–35 can be accessed by a 1571 (single or double-sided mode) and even a regular 1541. Files stored on tracks 36–70, however, can only be accessed by a 1571 in 1571 mode. (When experimenting with these different modes, you should use double-sided disks only.)

I have taken advantage of the 1571's unique features to reorganize many of my disks. For instance, first I format a disk in 1571 mode. Then, switching back to 1541 mode, I save my word processing program along with our club's newsletters on the bottom side of the disk. This way, all these files are accessible using normal 1541 mode. By switching to 1571 mode and issuing the command OPEN 15,8,15,''U0>H1'' :CLOSE15, however, I can save and load private letters stored on the top side of the disk. This way, my personal mail bag is kept from prying eyes.

First File Tip

Joseph R. Charnetski

Here's a time-saving tip packaged with a short utility program that allows 64 and 128 owners to make any file the first file on a disk.

When you first boot your computer system, you can load the first program on a disk by typing LOAD ''*'',8,1. After loading other programs, however, this command loads the *last* file accessed, not the first file on the disk. To insure that you load the first program in the directory, use the command LOAD '':*'',8,1 instead.

Because you can quickly and easily load the first file on a disk, you might want to place your most frequently used program first in the directory. With disks that already contain programs, this can be difficult.

The following program enables you to put any file into the first position on a disk. The program employs Copy, Scratch, and Rename commands, so type it in carefully.

```
ER 10 INPUT "CURRENT FIRST FIL
      E";F$(1)
EE 20 INPUT "DESIRED FIRST FIL
      E";F$(2)
GG 30 PRINT "WAIT.":OPEN 1,8,1
      5,"I0:"
BC 40 FOR I=1 TO 2:T$(I)="<"+M
      ID$(F$(I),2)
FP 50 PRINT#1,"C0:"+T$(I)+"=0:
      "+F$(I)
QA 60 PRINT#1,"S0:"+F$(I):NEXT
      :FOR I=1 TO 2
RD 70 PRINT#1,"R0:"+F$(I)+"=0:
      "+T$(I)
CQ 80 NEXT:CLOSE1:PRINT"{UP}DO
      NE."
```

When run, the program asks you for the name of the file that is currently first in the directory, and the name of the file that you want to be first in the directory. Both files should be on the disk in the drive known as device 8. After you have entered the name of each file, the computer asks you to wait as the program operates the disk drive. When the program is finished, the computer responds with the message DONE.

To see that your program has moved to the beginning of the directory, enter the following commmands:

```
LOAD "$",8
LIST
```

The specified file now appears first in the list, where you can easily load it with the command LOAD '':*'',8,1. ■

Easy Load

Christopher Miller

Use your directory listing as a menu, and load any file by simply typing LOAD in front of the filename. For the Commodore 128, 64, Plus/4, or 16. A disk drive is required.

One of the nicest things about the full-screen editors used on Commodore computers is that you can use a directory listing to load a file. The procedure is as follows: You load and list the directory, cursor up to the filename, type LOAD in front of it, cursor to the end of the filename, and type either *,8:* or *,8,1* and then press RETURN.

The time-consuming part of this procedure follows typing LOAD. You must move the cursor past the end of the filename and type three or four characters. With "Easy Load," the program accompanying this article, you'll never have to do this extra work again. Easy Load adds the device number (and the relocating flag number, if it's specified) to the end of the filename, so they become *part* of the file's directory entry. And since they're part of the directory, they're always there when you need them.

Using Easy Load

Easy Load is a BASIC program that runs on the 128, 64, Plus/4, and 16. To get started, just type it in, save a copy to disk, and type RUN. The first thing Easy Load asks is whether you want to enter a filename to convert, see a disk directory, or exit the program. If you know the name of the file you want to make easy to load, go ahead and enter it. If you're not sure of the file's name, take a look at the directory.

Next, Easy Load asks you to choose which characters you want to add to the name. Option 1 adds *,8:* to the filename, which you'll need for BASIC programs where the load address isn't needed; option 2 adds *,8,1*, which you'll need for ML programs; and option 3 aborts. Choose the option appropriate for the file you wish to convert.

Please note that the filename must always be 16 characters or less, *including* the *,8:* or the *,8,1*. Easy Load will check the filename, and if it's too long, you'll be asked if you'd like to rename the file. Here are two examples of the way Easy Load changes filenames:

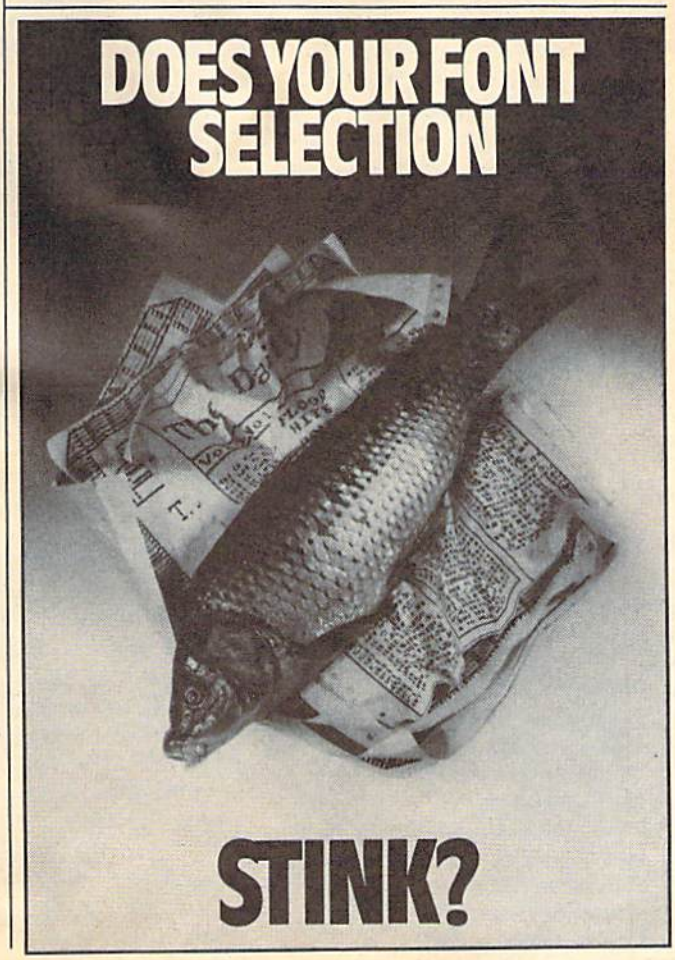
Old name	"TESTFILE"
Easy Load name	"TESTFILE",8:
Old name	"DEMO"
Easy Load name	"DEMO",8,1

Next, Easy Load asks if you want to convert another file. For now, answer no (press *n*). Let's look at the disk's directory. The file you converted will have either *,8:* or *,8,1* appended to it, depending on the choice you made when you used the program. To load your program, cursor up to the filename, type LOAD in front of it, and press RETURN. Your file will load without any further typing.

How It Works

The heart of this program is the 1541's RENAME command. The 1541 does an interesting thing when it sees graphics characters imbedded in filenames. It places them outside the filename's quotes. This is the heart of Easy Load, and it takes only two lines of the code to execute—lines 180 and 190. The rest of the program is devoted to error checking and ease of use.

See program listing on page 89.



Grand Pix

Robert Bixby

Your hi-res masterpiece becomes a giant poster when you use this unique variation of a screen dump. For the Commodore 64 and most printers, including Epson compatibles and all Commodore printers. A disk drive is required.

Normal screen dumps print your hi-res pictures on a single page. "Grand Pix" takes a different approach; it prints different parts of the picture on different sheets of paper. When the printing is done, you tape the sheets together to make a poster. Grand Pix uses character graphics to to make the poster, so it works with nearly any printer.

Grand Pix is written in machine language so you'll need MLX, the machine language entry program found elsewhere in this issue, to enter it. Three versions of Grand Pix are included—one each for Epson-, Commodore 1525–, and Commodore 1526–compatible printers. Odd-numbered Commodore printers, such as the MPS-801 and MPS-803, and the MPS-1200 are all compatible with the 1525 (the MPS 1200 also has an Epson compatibility mode). Even-numbered Commodore printers, like the MPS-802, are compatible with the 1526. Enter only the version of Grand Pix which is appropriate for your printer. If you're not sure which version to use, try the Epson version first.

The beginning and ending addresses for each version are as follows:

Epson
Starting Address: **0334**
Ending Address: **03FB**

Commodore 1525
Starting Address: **0334**
Ending Address: **03F3**

Commodore 1526
Starting Address: **0334**
Ending Address: **0403**

When you're ready to print your picture, load Grand Pix and type NEW to reset the BASIC pointers. Now load your hi-res screen. Grand Pix assumes that your picture will load into memory beginning at memory location 24576. This is where *DOODLE!* and many other drawing programs store their graphics screens. To load such a picture, type LOAD"*PICTURE*",8,1 (where *PICTURE* is the filename of the picture you want to load). Once again, type NEW.

If your hi-res screen is located elsewhere in memory, you'll need to type the following line:

```
POKE821,BA/256
```

where BA is the base address of your picture.

Grand Pix cannot access graphics under the Kernal ROM and won't access graphics under the BASIC ROM unless you switch out the ROM.

Type SYS 820 to print your picture.

The picture will be divided into four pieces. Each of the pieces will be separated by three blank lines. Use scissors to cut the picture on these lines, then use tape to put the pieces together. The first strip printed out is the leftmost quarter of the screen. The last strip is the rightmost quarter (see the accompanying figure).

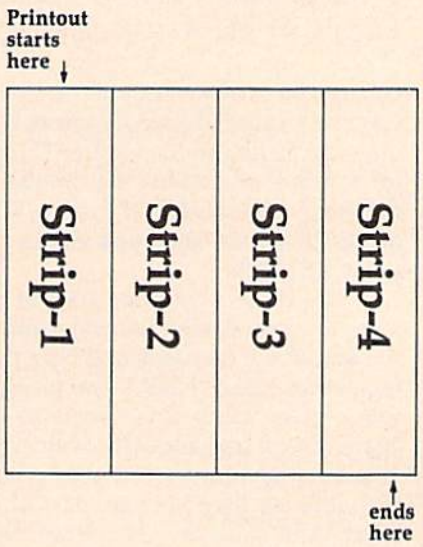
Normally, Grand Pix uses a space for empty screen pixels, and a # character for filled pixels. You can easily change the characters used with the following POKEs:

Epson version: **POKE 883,*filled***
POKE 887,*blank*

1525 version: **POKE 870,*filled***
POKE 874,*blank*

1526 version; **POKE 896,*filled***
POKE 900,*blank*

Check your printer manual for the ASCII values of the characters.



With scissors and tape, you can make your favorite graphics screen into a giant poster. After "Grand Pix" finishes printing, cut the strip into four smaller strips and tape them together as shown.

Posters And Banners

After you've made a few posters, try a banner by drawing the letters of your message with your favorite paint program. Then use Grand Pix to make your message into a banner.

Grand Pix sits quietly in its area of memory (the cassette buffer) until it is called upon, and it can easily be incorporated into your own BASIC drawing program.

See program listings on page 90.

Turbo *SpeedScript*

Bruce Anderson

If you use "TurboDisk," "TurboSave," and version 3.0 or higher of SpeedScript*—all found in past issues of GAZETTE—then this program is for you. Combining all three programs, this speedy utility "turbo-izes"* SpeedScript*'s load and save routines. For the 64. A disk drive is required.*

SpeedScript, COMPUTE! Publications' popular word processor, loads and saves text to disk as program files. "TurboDisk" and "TurboSave," two of GAZETTE's best disk utility programs, speed up the loading and saving of program files by approximately 300 percent. Put these three programs together and what do you get? A powerful word processor for the 64 that loads and saves text files at incredible speed.

The most recent version of *SpeedScript* for the 64 (version 3.2) is found in the May 1987 issue of COMPUTE!'s Gazette. TurboDisk can be found in the August 1986 issue, and TurboSave is in the April 1987 issue. Before you can use "Turbo *SpeedScript*," you must have all three of these programs.

Turbo-izing *SpeedScript*

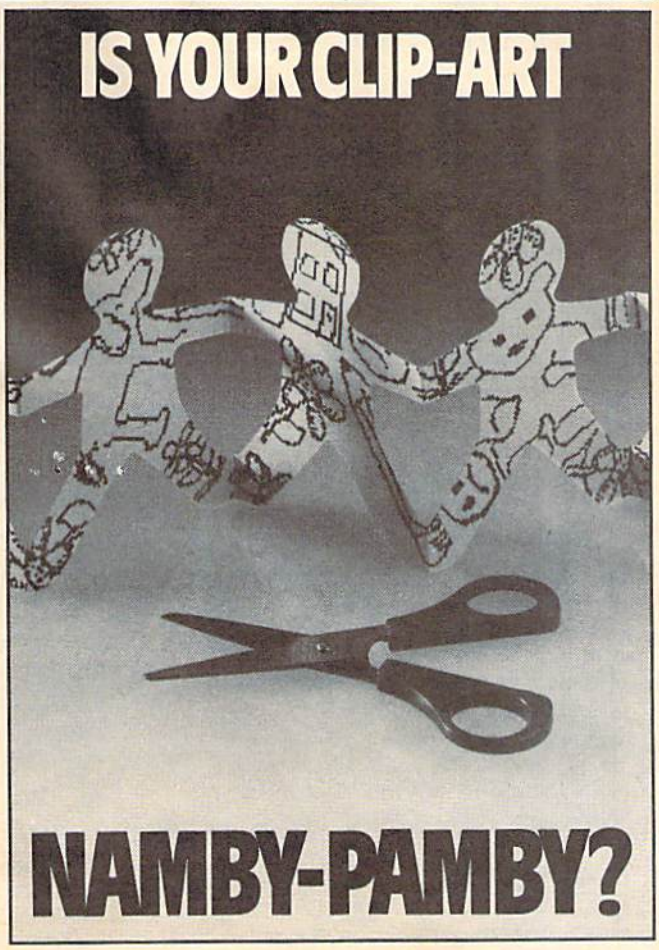
In order to use Turbo *SpeedScript*, you must save *SpeedScript*, TurboDisk, and TurboSave all on the same disk. Both *SpeedScript* and TurboSave can be loaded and saved like a BASIC program, but you'll need to use a file-copier program such as "Disk Rapid Transit," published in the December 1987 issue of GAZETTE, to transfer TurboDisk from one disk to another. Make sure *SpeedScript* is saved with the filename SPEEDSCRIPT, TurboDisk as TURBODISK, and TurboSave as TURBOSAVE.

To use Turbo *SpeedScript*, type in Programs 1 and 2. These are both short BASIC listings and shouldn't take long to enter. After them typing in, save a copy of each program to the disk containing the three programs *SpeedScript*, TurboDisk, and TurboSave. Save Program 1 using the filename TURBO SS and Program 2 using the filename ALTER SPDSCRPT.

TurboDisk and TurboSave do not work well with some printer interfaces. Because of this, Turbo *SpeedScript* is set up so that it does not load or save files while the printer is on. If your printer does not affect TurboDisk or TurboSave, omit line 4 in Program 1, and lines 1, 2, 3, and 5 in Program 2 (making Program 2 only one line long).

Every time you want to use *SpeedScript*, simply load and run the file TURBO SS. This program automatically loads and runs TurboDisk, TurboSave, and *SpeedScript*. The disk containing these programs must be in the disk drive when TURBO SS is run. When TURBO SS is finished, Turbo *SpeedScript* is up and running, and ready to use.

See program listings on page 86.



power BASIC

Impossible Borders

James Host

Through creative use of raster interrupts, these four screen dazzlers go where no 64 graphics have gone before—into the screen's borders. These impressive graphic displays are enough to catch anyone's attention.

Under normal operating conditions, animation within the 64's screen borders is impossible. However, through use of raster interrupts, colored areas of the border can be made to grow, shrink, and change in many different ways. Here we offer four such programs, each with a different twist.

Because these effects are the result of machine language interrupts, you can run BASIC and machine language programs while the screen borders dynamically change their display. This type of eye-catching graphics display can really liven up a program.

Getting Started

There are four programs accompanying this article. Each one demonstrates a different border-animation technique. Program 1 generates borders that appear to bounce; Program 2 creates an expanding and contracting effect; Program 3 provides a rainbow-like border; and Program 4 displays a border that "yo-yos" from the top of the screen in different colors.

Although the "Impossible Border" programs are machine language, they are in the form of BASIC loaders. It is recommended that you use "The Automatic Proofreader," found elsewhere in this issue, to insure accurate entry of the programs. Save a copy to disk or tape before running any of these programs.

Using The Programs

Load and run each program to see the different border effects. Pressing RETURN ends the program and restores the screen to normal.

The machine language for each of these programs executes in the background via a raster interrupt. So, while your screen's border is showing off, your computer could be running a BASIC program. To add an impossible border to a BASIC program, copy lines 62000 and up from any of the four demonstration programs. Once these lines are placed into your own program, a GOSUB 62000 installs the interrupt routine. This GOSUB needs to be done only once.

To turn on the impossible border, execute a SYS 49152. To turn it off, use a SYS 49155. Note that turning off an impossible border clears the display and resets the screen to it's default colors (blue on blue).

Impossible Borders works in BASIC's direct mode as well. For example, load and run one of the four demonstration programs; exit by pressing RETURN; and then, at the READY prompt, enter a SYS 49152. If you wish, you can even work on other programs while an impossible border is operating.

See program listing on page 86.

bug-swatter

Modifications and Corrections

Readers who have run Sketch Pad from the GAZETTE Disk menu have discovered that the *change brush* option does not work. Since this problem shows up only when the program is run from the menu, the simple solution is to run Sketch Pad directly. To do this, load Sketch Pad (LOAD"SKETCH PAD MENU",8) and type RUN.

• Program 2 from "Sprite Monitor" (November 1987) does not save the sprite data correctly. The problem is caused by a pointer that is incorrectly initialized. The following short program will correct the problem. If you have Program 2 saved under a filename other than SPRITE MON 49152, change the variable, NM$, in line 10.

```
XG 10 NM$="SPRITE MON 49152"
PM 20 IF A=0 THEN A=1:PRINT"LO
      ADING...":LOAD NM$,8,1
QG 30 POKE49754,195:OPEN15,8,1
      5,"S0:"+NM$:INPUT#15,EN,
      EM$,ET,ES:CLOSE15
ED 40 PRINTEN;EM$;ET;ES:PRINT
      {SPACE}"SAVE THE CORRECT
      ED VERSION..."
SF 50 OPEN1,8,1,"0:"+NM$+",P,W
      "
PF 60 POKE193,0:POKE194,192:PO
      KE780,193:POKE781,95:POK
      E782,195:SYS65496
HP 70 CLOSE1
```

• Several readers have had difficulty entering line 17F1 of "Bee Zone" (September 1987). The last number on that line looks like *CE*, when in fact it should be *CB*.

• The paint and background color selectors from "Sketch Pad" (November 1987) do not set the colors correctly. The colors are off by one position. Line 340 needs a minor modification in order for the color selectors to work correctly.

```
BR 340 IFC1<3THENPRINTTAB(20);
       :FORD=0TO15:POKE646,D:P
       RINT"{RVS} {OFF}";:NEXT
       :PRINT:GOTO360
```

Multi-LIST

Steve Grace

Programmers can save a lot of time with this short listing utility. By entering a series of filenames, you can cause the computer to print program listings in the order you prescribe while you're doing something else. For the 64, 128, Plus/4, and 16. A disk drive and printer is required.

"Multi-LIST" is a time-saving program you can use to print multiple program listings in one shot. Just enter a list of filenames, and walk away. Without programmer supervision, Multi-LIST loads each file, one by one, and lists them to the printer.

Multi-LIST works with almost any printer and Commodore computer combination. With the 64, 128, and Plus/4, you can list up to 144 BASIC programs. On the 16, you're limited to 32 programs. Also, the 16 cannot list programs longer than 10K in length.

Using The Program

Multi-LIST is a short BASIC program. Type it in using "The Automatic Proofreader" program found elsewhere in this issue. After you enter the program, be sure to save a copy to disk. To use Multi-LIST, simply load the program and type RUN.

When run, the program asks you to select uppercase or lowercase listings by entering a U or L. Uppercase is the default. At this point, put the disk containing the programs to be listed in the disk drive. All the programs to be listed must be on the same disk.

Enter the filename of each program, one at a time. When you're done, simply press RETURN without entering a program name. The specified programs are loaded and listed in the order they were entered. A formfeed is sent to the printer between each listing.

How It Works

Multi-List has two main sections: The first section sets up various functions and accepts the user's input; the second section uses the dynamic keyboard technique to do the actual listing. To see the dynamic keyboard in action, remove the POKE646,PEEK(53281) from line 310 and run the program.

For each listing, the start of BASIC is raised above the Multi-LIST program. This way, Multi-LIST can load other programs without destroying itself. Once a program is loaded into the BASIC workspace, it is listed to the printer. When the listing is complete, the start-of-BASIC is lowered to its original position and Multi-LIST's main loop is rerun. This process repeats until all the programs have been listed.

Customizing

As written, Multi-LIST assumes that the printer is device 4, the secondary address for lowercase printouts is 7, and that the formfeed code is CHR$ (12). If your printer requires different values, change lines 270, 300, and 310, respectively.

If you plan to renumber Multi-LIST, you must change the RUN in line 340 to execute to the line number currently at 220 (the line following REM RUN-TIME CODE). Because this RUN appears inside quotes, it is not renumbered by renumbering utilities.

See program listings on page 86.

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BATTERIES INCLUDED

machine language programming

Jim Butterfield
Associate Editor

Let's take a simple BASIC program and convert it to machine language. Here's one that prints all characters from ASCII 32 (a space) to ASCII 127 (a graphics symbol).

```
100 FOR X=32 TO 127
110     PRINT CHR$(X);
120 NEXT X
130 PRINT
```

Such a program is well suited to machine language conversion, since it prints one character at a time. In machine language, you can print as much material as you like, but you must output each character separately.

Machine language doesn't have an equivalent for the FOR and NEXT statements, so let's rewrite the BASIC program to show the loop in a more elemental manner.

```
100 X=32
110     PRINT CHR$(X);
120 X=X+1
121 IF X<128 THEN GOTO 110
130 PRINT
```

You may run either of the above programs if you wish; they both accomplish the same thing. Now, let's write a plan that breaks the program down into simple steps:

```
(100)  Move value 32 into X
(110)  Call the print routine
(120)  Add one to the value in X
(121)  Compare X to value 128;
       Go to 110 if less-than
(130)  Print RETURN character
```

Line numbers corresponding to the original BASIC program appear inside parenthesis.

BASIC To Assembly Language

Next, let's rewrite our plan in assembly language—not quite machine language, but well on the way. (Remember: Machine language uses the actual numbers that the computer understands as instructions. Assembly language uses letters to represent the numbers used in machine language instructions. Each assembly language instruction translates directly into a single machine language instruction.)

Assembler Output

```
033C  A2 20     LDX  #$20   ;Move 32 into X
033E  8A        TXA
033F  20 D2 FF  JSR  $FFD2  ;Call print routine
0342  E8        INX         ;Add one to value in X
0343  E0 80     CPX  #$80   ;Compare X to 128
0345  90 F7     BCC  $333E  ;Go to 110 (address $033E) if less
0347  A9 0D     LDA  #$0D
0349  20 D2 FF  JSR  $FFD2  ;Print RETURN char.
034C  60        RTS
```

```
(100)  LDX  #$20  ;Move 32 into X
```

This instruction means to LoaD the X register (LDX) with the immediate (#) hexadecimal ($) value 20 (decimal 32). Any text following a semicolon is a remark and does not affect the program's operation.

The 6502 processor chip (including all the eight-bit microprocessors in the 6502 family) has three data registers, called X, Y, and A. We were using X above; now we'll make use of A.

```
(110)  TXA
       JSR  $FFD2  ;Call print routine
```

The subroutine at address $FFD2 is in ROM and prints whatever character it finds in the A register. Our number is in X, so first we have to move the value of X to the A register with the Transfer X to A command (TXA). With a copy of the data in the A register, we call the print subroutine with a Jump SubRoutine (JSR) command.

Some subroutines change the contents of registers A, X, and Y. Fortunately, we can depend on the print routine at $FFD2 (often called CHROUT or BASOUT) to leave the X and Y registers untouched. This way, we can use the value of the X register after a call to $FFD2 and be confident that the value in X was left undisturbed.

```
(120)  INX  ;Add one to value in X
```

We want to add one to the value in the X register. A convenient command, INcrement X (INX), allows us to do this simply. Our next task is to compare X with 128.

```
(121)  CPX  #$80  ;Compare X to 128
       BCC  ????  ;Go to 110 if less
```

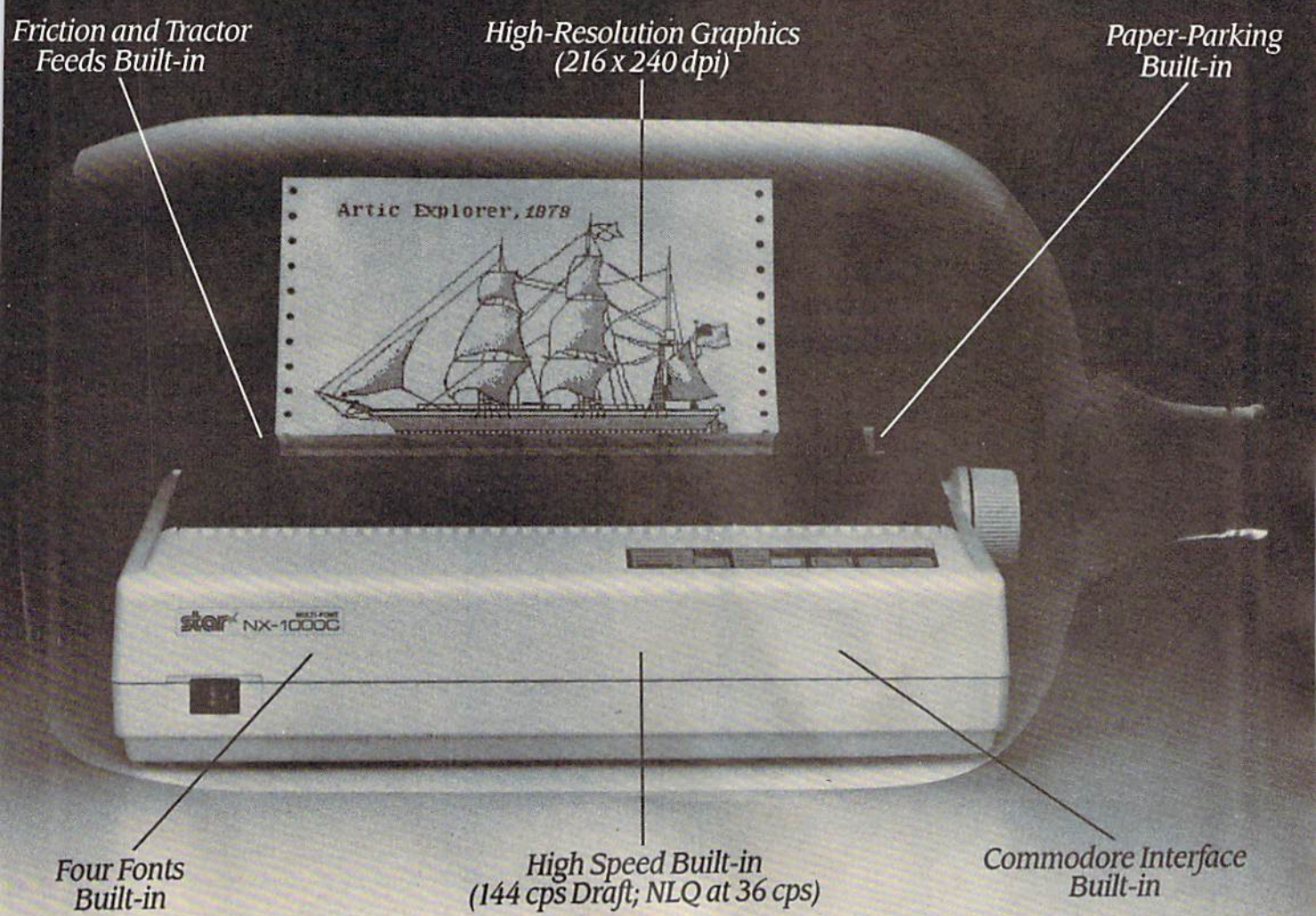
Here we ComPare X (CPX) to the immediate hexadecimal value 80, which corresponds to decimal 128. In this case, the command Branch on Carry Clear (BCC) means the same as branch if less than. Where do we branch? Back to the instruction corresponding to line 110, of course. Since machine language does not have line numbers, we'll need to work out the actual address of the instruction and put it in place of the question marks later on.

Finally, we need to print a RETURN character. The ASCII for RETURN is decimal 13, or hexadecimal 0D.

```
(130)  LDA  #$0D
       JSR  $FFD2  ;Print RETURN char.
       RTS
```

We LoaD A (LDA) with the value of a RETURN character, and then call the CHROUT subroutine. Finally, we wind up the program with the command ReTurn from Subroutine (RTS). Almost all machine language programs are written as subroutines. When they are finished, they use the RTS instruction to return to the place from which they were called. RTS is much like BASIC's RETURN command.

The new Star Multi-Font. How did Star get it all in there?


Friction and Tractor Feeds Built-in
High-Resolution Graphics (216 x 240 dpi)
Paper-Parking Built-in
Artic Explorer, 1879
star NX-1000C
Four Fonts Built-in
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Whether it's for serious work or serious play, the Star NX-1000C Multi-Font has so much built-in, you'll get more out of your Commodore. To find out where you can see the Multi-Font, call 1-800-447-4700.

star micronics

The ImagePower™ Printers

Multi-Font printout produced by Flexidraw 5.5 graphics software by Inkwell Systems.

Assembly To Machine Language

What we have just written is a program in assembly language. That's not machine language, but it's very close. A program called an *assembler* translates assembly language to machine language for you. Its output is interesting. Each line in an assembler's listing contains the current address, the machine language instruction, and the assembly code along with any comments that have been included. Usually, the memory address and machine language instructions are represented in hexadecimal. The assembler output for our program is shown in the accompanying table.

The only part of this printout that goes into the computer's memory is the machine code (A2 20 8A 20 . . .) The addresses shown in this example are suitable for all Commodore 6502-based computers other than the Commodore 128 in 128 mode.

This program could be shown in the form of a *hex dump*, which looks something like this:

```
033C  A2 20 8A 20 D2 FF E8 E0
0344  80 90 F7 A9 0D 20 D2 FF
034C  60 00 00 00 00 00 00 00
```

In the above case, the user would be expected to use a *machine language monitor*, or an entry program such as "MLX" to enter the bytes into memory. Alternatively, we could ask a BASIC program to put the bytes into memory for us. For example:

```
100 DATA 162,032,138,032,210,255
110 DATA 232,224,128,144,247,169
120 DATA 013,032,210,255,096
200 A=828
210 FOR J=A TO A+16
220     READ X
230     POKE J,X
240 NEXT J
```

After running this BASIC program, you may call the machine language routine with the command SYS 828. This command tells BASIC to jump to the machine language subroutine found in memory at 828.

For the Commodore 128 in 128 mode, change line 200 to read A=2304, and call the machine code with a SYS 2304. Just like its BASIC counterpart, the machine language program prints all ASCII characters between 32 and 127.

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Fast 64 Mode For The 128

David Schreiber

Double the processing speed in 64 mode on your Commodore 128 with this short utility.

Commodore 128 owners have doubtless many times wished that 128 BASIC's FAST command was available in 64 mode. With such a command, you could double the speed at which the 64 does things like reading DATA statements and performing calculations. "Fast 64" does just that.

Speed Up

Fast 64 is in the form of a BASIC loader. To get started, just type it in, save a copy to disk or tape, and run it like any BASIC program.

When you run Fast 64, you'll see four SYS commands and addresses printed at the top of your screen. These are the commands you'll use to access FAST mode on your 64.

The first command, SYS 828, enables a key that toggles FAST or SLOW mode. The program's default is to use Control-F1, but this can be altered if you prefer to use another Control-key combination. (We'll discuss how to do this a little later.) The next command, SYS 831, simply disables the key toggle. By default, the toggle is disabled.

If you want to use Fast 64 from within a program, the next two addresses are what you'll need. The first, SYS 834, switches to FAST mode, and the last, SYS 837, returns to SLOW mode.

When you invoke FAST mode—either with SYS 834, or by using the Control-F1 toggle—the screen blanks. This is nothing to worry about: The VIC II chip that handles video output simply can't keep up with the FAST mode's speed, so the screen isn't usable. When you return to SLOW mode—either by using the Control-F1 toggle, or by issuing the SYS 837 command from within a program—the screen will return to normal.

With the Control-F1 toggle, you can use Fast 64 even with programs that write to the screen. You simply toggle FAST mode *on* when time-consuming processing is being done, and *off* when the screen is needed.

A Test

To get an idea of how much Fast 64 can improve the speed of your 128/64's internal processing, go to 64 mode, run Fast 64, and type NEW. Then type in, save to disk, and run the following short program:

```
10 TI$ = "000000"
20 FORI = 1TO10000:NEXT
30 PRINT"SLOW = "TI$
40 TI$ = "000000"
50 SYS834:FORI = 1TO10000:
   NEXT:SYS837
60 PRINT"FAST = "TI$
```

This program simply tests how long it takes the 128's 64 to count up to 10,000 using a FOR-NEXT loop in normal mode, and then using Fast 64's FAST mode. The two numbers printed by the program are the time in seconds it takes for the computer to count to 10,000 in each mode. When you run this program, you'll discover that in FAST mode, the 64 is twice as fast as in SLOW mode.

It's interesting to run this program in the 128's native mode, to compare its times to the 64's. To do this, reboot (to enter 128 mode), load the test program, and change line 50 to read:

```
50 FAST:FORI = 1TO10000:NEXT:SLOW
```

Now type RUN. You'll notice that FAST mode is about twice as fast as SLOW mode on the 128, too, but there is something else interesting here. The FAST mode of the 64 is about 30 percent faster than FAST 128 mode. This speed advantage in the 64 mode holds true only for BASIC programs, but it is an important consideration if speed is important.

Changing The Toggle Key

The default toggle key for the Fast 64 is Control-F1. The key used with the Control key can be changed, however, to any value you wish. The second data statement in line 160 is the *keyboard matrix code* the program uses for the toggle. Keyboard matrix codes are special values the 64 uses to decode the keyboard. The keys and the codes associated with each can be found

on page 161 of Raeto Collin West's *Programming the Commodore 64* (COMPUTE! Books, 1985). If you don't have access to this book, the following short program from 64 mode will tell you the keyboard matrix code of any key. (To run this program in 128 mode, change the PEEK value in line 30 from 203 to 212.)

```
10 PRINT "↑ QUITS"
20 GETA$:IFA$ = "" "THEN 20
30 PRINTA$" = "PEEK(203)
40 IFA$<>"↑ "THEN20
```

When you run this program, the keyboard matrix code of any key you press will be printed along with the key's character value. The program will continue printing keyboard codes for any key pressed until you type the quit character, the up arrow (↑).

When you've selected the new keyboard code to use with the Control key, replace the 4 in the second DATA statement in line 160 of Fast 64 with the new code. For example, to have Control-S toggle FAST mode, use the value 13—the keyboard matrix code for S. You'll also need to change the checksum 9998 in line 50. The easiest way to correct the checksum is to add your keycode to 9994, and use the result as the new checksum. For Control-S, the new checksum will be 9994 + 13, or 10007.

Notes

There are two important things to note about Fast 64. First, when FAST mode is active, don't attempt to access anything attached to your computer—like disk drives, printers, modems, memory expansion, and so on. Since the 64 doesn't know about FAST mode, it won't be able to compensate for the speed, and its timing will be thrown off. Second, Fast 64 works by modifying the IRQ routine, so it will work as long as another program doesn't change the vector.

See program listing on page 85.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

Mosaic

Article on page 44.

```
JB 10 REM COPYRIGHT 1988 COMPU
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      GHTS RESERVED
PF 20 DIMR,P,N,H,L,T,X,Y,A,B,C
      ,N$(4):S=53248:POKES+21,
      0:POKES+32,6:POKES+24,21
MC 30 X$="VNMNVMNMZNM":FORR=1T
      04:X$=X$+X$:READN$(R):NE
      XT:F=256:CO=7:GOSUB1210
DG 40 LN=214:YS=679:DIMH(11,2)
      ,B(11,2),P(2),C(2)
FP 50 REM*** ENTER ML DATA ***
AE 60 FORR=YSTOR+25:READP:POKE
      R,P:T=T+P:NEXT
RB 70 FORP=0TO2:B(0,P)=1:B(11,
      P)=1:H(11,P)=65:NEXT:W=8
      28:R=RND(-RND(-TI))
FJ 80 DEFFNV(T)=INT((T-H(L,P))
      /(H(H,P)-H(L,P))*(H-L-1)
      +L+1)
BE 90 DEFFNL(P)=(P+(P=0)OR(P>P
      N))*6+11-2*PN:DEFFNP(P)=
      (2=PORPORGNAND1)-1
QX 100 REM *** CLEAR CASSETTE
       {SPACE}BUFFER ***
PC 110 POKE1023,0:POKE781,1:PO
       KE782,191:POKE91,3
PC 120 POKE90,65:POKE89,3:POKE
       88,64:SYS41964
RH 130 REM *** DRAW SPRITE ***
QB 140 FORR=832TOR+35STEP6:REA
       DX,Y:FORP=RTOR+3STEP3:P
       OKEP,X:POKEP+1,Y:NEXTP,
       R
KF 150 POKES+23,10:POKES+28,10
       :POKES+29,10:POKES+37,8
       :POKES+38,0:POKES+39,7
QK 160 POKES+40,2:POKES+41,7:P
       OKES+42,2:POKES+4,174:P
       OKES+6,174
EE 170 POKE2040,14:POKE2041,13
       :POKE2042,15:POKE2043,1
       3
HC 180 REM *** NUMBER TILES **
       *
PH 190 FORR=1TO64:DK$=DK$+CHR$
       (R):NEXT
XG 200 REM *** GET SELECTION F
       ROM MENU ***
BF 210 POKE198,0
MB 220 GETD$:IFD$=""THEN220
HR 230 IFD$="{F7}"THENCO=7-CO:
       GOSUB1260:GOTO210
AS 240 IFD$=CHR$(13)THEND$="4"
       :GOTO270
SB 250 IFD$="0"THENIFGMTHEN300
CD 260 IFD$<"1"ORD$>"4"THEN210
DQ 270 G=0:GM=0:GN=VAL(D$):PN=
       1-(GN>2):N$(0)=N$(ABS(G
       N-2)+2)
KJ 280 M=146-16*PN:POKES+5,M+5
       :POKES+7,M+5:FORR=0TOPN
       :P(R)=0:NEXT
FD 290 REM *** DEAL HANDS ***
FK 300 GOSUB1340:D=64:FORP=0TO
       PN:POKELN,FNL(P):PRINT
MH 310 PRINT"{UP}{RIGHT}{7}"N$
       (P)TAB(80-LEN(STR$(P(P)
       )));MID$(STR$(P(P)),2):
       FORR=1TO10
MJ 320 GOSUB1030:H(R,P)=T:B(R,
       P)=0:PRINT"{DOWN}{13}
       {OFF}{K}{YEL}";:IFFNP(P
       )THENPOKE646,CO
CG 330 PRINTRIGHT$(STR$(T),2)"
       {RED}{RVS}{K}{DOWN}
       {4 LEFT}{13}{F}{RED}
       {OFF}{2 I}{RVS}{D}
       {2 UP}{4 LEFT}{13}{V}
       {2 I}{RED}{C}";:NEXTR,P
       :HM=11:P=G
ES 340 GOSUB1020:GOSUB1310:GOS
       UB1170:FORP=0TOPNSTEP2:
       L=0:H=11:GOSUB1060:NEXT
       :P=G
JE 350 REM *** MAIN LOOP ***
MP 360 P=-(P+1)*(P<PN):IFFNP(P
       )THEN460
PH 370 REM *** GET PLAYER'S MO
       VE ***
XR 380 POKE198,0
FX 390 GETD$:IF(D$<"0"ORD$>"9"
       )ANDD$<>" "THEN390
GX 400 IFD$<>" "THEN430
MQ 410 GOSUB1020:GOSUB1160:POK
       E198,0
GS 420 GETD$:IF(D$<"0"ORD$>"9"
       )ANDD$<>" "THEN420
HB 430 GOSUB1330:IFD$=" "THENP
       OKES+21,3:GOSUB1310:GOT
       O360
QS 440 N=VAL(D$)-10*(D$="0"):P
       RINT"{YEL}":GOTO510
HF 450 REM *** GET COMPUTER'S
       {SPACE}MOVE ***
CH 460 GOSUB740:IFB(N,P)-1ORET
       HEN490
CC 470 GOSUB1020:GOSUB1160:GOS
       UB740:IFB(N,P)-1ORETHEN
       490
AX 480 R=(N=L)-(N=H):IFRTHENIF
       ABS(T-H(N,P))<ABS(T-H(N
       -R,P))THENN=N+R:E=1
AF 490 GOSUB1330
CG 500 REM *** MAKE PLAY ON SC
       REEN ***
MX 510 POKES+21,3:I=N-5.5:SN=-
       1.5*(SGN(P-.5)-(P=2)):X
       =168:FORY=MTOY-SN*32STE
       P-SN
CE 520 POKEW,X:POKEW+1,Y:SYSYS
       :X=X+I:IFX>=FTHENX=X-F:
       POKEW+2,3
SM 530 NEXT:POKELN,FNL(P):IFFN
       P(P)THENPOKE646,CO
PH 540 PRINT:PRINTTAB(4*N+37)R
       IGHT$(STR$(T),2):R=H(N,
       P):H(N,P)=T:T=R
EE 550 FORR=1TO9:IFH(R,P)<H(R+
       1,P)THENNEXT
PG 560 C(P)=R:ONJ1-RGOTO610:GO
       SUB1310:GOSUB1110:POKE1
       98,0:X=X-I:FORY=Y+SNTOM
       STEPSN
SM 570 POKEW,X:POKEW+1,Y:SYSYS
       :X=X-I:IFX<0THENX=X+F:P
       OKEW+2,0
EX 580 NEXT:IFFNP(P)THENIFE+B(
       N,P)=0THENB(N,P)=1:HM=H
       :H=N:GOSUB1060
FX 590 E=0:GOTO360
RQ 600 REM *** WIN ROUTINE ***
DP 610 POKELN,FNL(0)+4:PRINT:P
       RINTTAB(8)"{WHT}"N$(P)"
       {RIGHT}WINS{RIGHT}ROUND
       {RIGHT}";MID$(STR$(GM+1
       ),2);
AS 620 PRINT"!{YEL}":POKES+21,
       0:FORR=0TOPN:PRINT,"
       {RIGHT}"RIGHT$("
```

```
        {4 RIGHT}"+N$(R),11)":
        {RIGHT}";
KF 630  PRINTRIGHT$(STR$(C(R)*5
        ),2):NEXT:GM=GM+1:G=G+1
        :IFG>PNTHENG=0
PB 640  POKE646,14:FORR=0TOPN:Y
        =0:D=7:IFP=RTHEND=1
GJ 650  FORX=55377+FNL(R)*40TOX
        +39STEP4:Y=Y+1:IFY>C(R)
        THEND=11
JH 660  POKEX,D:POKEX+1,D:NEXTX
        :P(R)=P(R)+C(R)*5
XQ 670  POKELN,FNL(R):PRINT:PRI
        NT"{UP}"SPC(40-LEN(STR$
        (P(R))))MID$(STR$(P(R))
        ,2):NEXTR
DQ 680  POKELN,FNL(1)+4:PRINT:P
        RINTTAB(6)"{CYN}PRESS
        {RIGHT}ANY{RIGHT}KEY;
        {RIGHT}[F1]{RIGHT}FOR
        {RIGHT}MENU":POKEW+2,3
DC 690  POKE198,0
MD 700  GETD$:IFD$=""THEN700
GJ 710  IFD$="{F1}"THENGOSUB121
        0:GOTO210
ES 720  GOTO300
EJ 730  REM *** SBR: CHOOSE BES
        T PLAY ***
HD 740  N=INT(T/6.5+1):IFB(N,P)
        THEN920
QX 750  FORL=N-1TO1STEP-1:IFB(L
        ,P)-1THENNEXT
DR 760  IFT<H(L,P)THENN=L:GOTO9
        20
RX 770  FORH=N+1TO10:IFB(H,P)-1
        THENNEXT
BA 780  IFT>H(H,P)THENN=H:GOTO9
        20
RE 790  N=FNV(T):IFH-L<4ORT-H(L
        ,P)<6ORH(H,P)-T<6THENRE
        TURN
PR 800  B=0:Y=L:HM=H:X=N:C=0
CX 810  H=E+X:IFB(H,P)THEN870
ER 820  A=H(H,P):IFC=0THENH(H,P
        )=T
SB 830  B(H,P)=1:GOSUB1060:H=E+
        X:L=0
XJ 840  FORR=Y+1TOHM-1:L=L+B(R,
        P):NEXT:H(H,P)=A:A=B<L:
        IFATHENB=L:N=H
KA 850  FORR=Y+1TOHM-1:IFATHENB
        (R,1)=B(R,P)
HF 860  B(R,P)=0:NEXT:L=Y
FR 870  IFE-1THENE=(E=0)-E:GOTO
        810
FS 880  IFCORH(N,P)<H(Y,P)ORH(N
        ,P)>H(HM,P)THEN910
BP 890  IFH(N,P)-H(Y,P)<4*(N-Y-
        1)ORH(HM,P)-H(N,P)<4*(H
        M-N-1)THEN910
BJ 900  IFABS(T-H(N,P))<(H(HM,P
        )-H(L,P))/(HM-L-1)THENC
        =B:X=N-1:H=N:B=B-1:GOTO
        820
XR 910  FORR=Y+1TOHM-1:B(R,P)=B
        (R,1):NEXT:IFC=0ORB<CTH
        ENRETURN
DD 920  E=0:FORL=NTO1STEP-1:IFB
        (L-1,P)THENNEXT
DR 930  FORH=NTO10:IFB(H+1,P)TH
        ENNEXT
MS 940  IFT<H(L,P)THENN=L-1:GOT
        O750
CH 950  IFT>H(H,P)THENN=H+1:GOT
        O750
SH 960  FORN=LTOH:IFT>H(N,P)THE
        NNEXT
RJ 970  IFL=0THEN990
QE 980  N=N+(N-L<=H-NORH>9):IFN
        =H=L-HTHENN=N+(H(N-1,P)
        <H(N-2,P)ANDH(N-2,P)<T)
EM 990  R=(N=L)-(N=H):IFRTHENIF
        (H(N,P)<H(N+R,P))=(H(N+
        R,P)<T)THENB(N,P)=0:GOT
        O750
AX 1000 RETURN
QC 1010 REM *** SBR: DRAW NEXT
         TILE ***
PA 1020 POKE781,1:POKE782,62:P
        OKE91,3:POKE90,128:POK
        E89,3:POKE88,192:SYS41
        964
AD 1030 X=RND(1)*D+1:DK$=LEFT$
        (DK$,X-1)+MID$(DK$,X+1
        )+MID$(DK$,X,1)
HJ 1040 T=ASC(RIGHT$(DK$,1)):D
        =D-1:RETURN
AJ 1050 REM *** SBR: EVALUATE
        {SPACE}HAND ***
AC 1060 FORR=L+1TOH-1:IFFNV(H(
        R,P))=RTHENB(R,P)=1:ON
        R-LGOTO1080:H=R:GOTO10
        60
QS 1070 NEXT:IFR>=HMTHENRETURN
DG 1080 FORL=RTOHM-2:IFB(L+1,P
        )THENNEXT:RETURN
BP 1090 FORR=L+1TOHM-1:IFB(R,P
        )-1THENNEXT
MB 1100 H=R:GOTO1060
SX 1110 REM *** SBR: CHANGE NU
        MBERS IN SPRITE ***
GE 1120 A=S+8*ASC(RIGHT$(STR$(
        T),2)):B=S-A+8*(ASC(RI
        GHT$(STR$(T),1))):C=92
        1
BJ 1130 POKE56333,127:POKE1,25
        1:FORR=ATOA+7:POKEC,PE
        EK(R)
QS 1140 POKEC+1,PEEK(R+B):C=C+
        3:NEXT:POKE1,255:POKE5
        6333,129:RETURN
BK 1150 REM *** SBR: MOVE TILE
         ONTO SCREEN ***
MA 1160 FORR=1TO10:POKEW,R/2+1
        68:POKEW+1,R/2+M:SYSYS
        :NEXT:POKES+21,12
KB 1170 POKEW+1,M:POKEW,225:PO
        KEW+2,3:SYSYS:POKES+21
        ,PEEK(S+21)OR3
CP 1180 POKE198,0:GOSUB1110:A=
        244:FORR=1TO90:A=A+2:I
        FA=FTHENPOKEW+2,0:A=0
CP 1190 POKEW,A:SYSYS:NEXT:RET
        URN
QR 1200 REM *** SBR: PRINT MEN
        U SCREEN ***
PS 1210 GOSUB1340:PRINT"
        {2 DOWN}"LEFT$("
        {3 RIGHT}{CYN}[0]
        {2 RIGHT}CONTINUE
        {RIGHT}CURRENT{RIGHT}G
        AME",SGN(GM)*30)
MM 1220 PRINT"{YEL}{3 RIGHT}[1
        ]{2 RIGHT}PLAYER
        {RIGHT}VS{RIGHT}PLAYER
        "
DM 1230 PRINT"{3 RIGHT}[2]
        {2 RIGHT}PLAYER{RIGHT}
        VS{RIGHT}COMPUTER"
HR 1240 PRINT"{3 RIGHT}[3]
        {2 RIGHT}PLAYER{RIGHT}
        VS{RIGHT}PLAYER{RIGHT}
        VS{RIGHT}COMPUTER"
HA 1250 PRINT"{3 RIGHT}[4]
        {2 RIGHT}PLAYER{RIGHT}
        VS{RIGHT}COMPUTER
        {RIGHT}VS{RIGHT}COMPUT
        ER{2 DOWN}"
RG 1260 PRINT"{HOME}{14 DOWN}"
        :PRINTTAB(8)"{CYN}TO
        {RIGHT}"MID$("SHOW
        {3 SPACES}HIDE",CO+1,4
        );
JB 1270 PRINT"{RIGHT}COMPUTER'
        S{RIGHT}TILES,":PRINTT
        AB(7)"PUSH{RIGHT}[F7]
        {RIGHT}BEFORE{RIGHT}SE
        LECTION."
QG 1280 PRINTTAB(3)"{2 DOWN}
        {WHT}COPYRIGHT{RIGHT}1
        988{RIGHT}COMPUTE!
        {RIGHT}PUB.,{RIGHT}INC
        ."
HG 1290 PRINTTAB(10)"ALL
        {RIGHT}RIGHTS{RIGHT}RE
        SERVED{UP}":RETURN
CC 1300 REM *** SBR: PRINT GUI
        DE ***
PX 1310 POKELN,FNL(P+1)+1:PRIN
        T:PRINT"[7]{DOWN}{RVS}
        £1{OFF}";
HD 1320 PRINT"£{RIGHT}{RVS}£
        2{OFF}£{RIGHT}{RVS}£
        3{OFF}£{RIGHT}{RVS}£
        4{OFF}£{RIGHT}{RVS}£
        5 {2 RIGHT} 6[*]
        {RIGHT}{OFF}[*]{RVS}7
        [*]{RIGHT}{OFF}[*]
        {RVS}8[*]{RIGHT}{OFF}
        [*]{RVS}9[*]{RIGHT}
        {OFF}[*]{RVS}0[*]{UP}"
        ;:RETURN
CC 1330 PRINT"{BLU}{OFF}"MID$(
        X$,7*FNL(P)-4,40)"
        {YEL}";:RETURN
SF 1340 POKES+17,43:PRINT"
        {BLU}{H}{CLR}"X$X$X$X$
        X$LEFT$(X$,118)"N
        {LEFT}{INST}Z{HOME}
        {OFF}{WHT}",
PG 1350 PRINT"{LEFT}M{3 RIGHT}
        O{3 RIGHT}S{3 RIGHT}A
        {3 RIGHT}I{3 RIGHT}C":
        POKES+33,0:POKES+17,27
        :RETURN
RX 1360 DATA"PLAYER{RIGHT}1","
        COMPUTER{RIGHT}1","PLA
        YER{RIGHT}2","COMPUTER
        {RIGHT}2"
CF 1370 DATA173,17,208,16,251,
        160,2,185,59,3,153,255
        ,207
ME 1380 DATA153,1,208,136,208,
        244,173,62,3,141,16,20
        8,96
PK 1390 DATA21,88,95,250,127,2
        54,127,254,95,250,26,1
        68
```

Fast 64 Mode For The 128

Article on page 83.

```
HE 10   REM COPYRIGHT 1988 COMPU
        TE! PUBLICATIONS, INC. -
         ALL RIGHTS RESERVED
RH 20   PRINT"{CLR}{3 SPACES}COP
        YRIGHT 1988 COMPUTE! PUB
        ., INC."
KM 30   PRINTTAB(10)"ALL RIGHTS
        {SPACE}RESERVED{DOWN}"
HX 40   FORC=828TO954:READD:POKE
        C,D:CS=CS+D:NEXT
MD 50   IFCS<>11484THENPRINT"THE
        RE IS AN ERROR IN THE DA
        TA STATEMENTS":END
FB 60   PRINT"SYS 828 TO ENABLE
        {SPACE}KEY TOGGLE":PRINT
        "SYS 831 TO DISABLE KEY
        {SPACE}TOGGLE"
PB 70   PRINT"SYS 834 FOR FAST M
        ODE":PRINT"SYS 837 FOR S
        LOW MODE":END
PX 80   DATA76,72,3,76,102,3,76,
        159
```

```
JX 90 DATA3,76,173,3,120,173,2
      0,3
XM 100 DATA141,52,3,173,21,3,1
      41,53
BQ 110 DATA3,169,117,141,20,3,
      169,3
CC 120 DATA141,21,3,88,169,12,
      141,54
FM 130 DATA3,96,120,173,52,3,1
      41,20
JE 140 DATA3,173,53,3,141,21,3
      ,88
DF 150 DATA96,173,54,3,208,29,
      165,203
HF 160 DATA201,4,208,26,173,14
      1,2,201
KR 170 DATA4,208,19,169,1,77,4
      8,208
KQ 180 DATA141,48,208,169,12,1
      41,54,3
SK 190 DATA108,52,3,206,54,3,1
      65,203
SC 200 DATA108,52,3,173,17,208
      ,41,139
KJ 210 DATA141,17,208,169,1,14
      1,48,208
RG 220 DATA96,173,17,208,9,16,
      141,17
CS 230 DATA208,169,0,141,48,20
      8,96
```

Multi-LIST

Article on page 79.

```
HF 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS INC. -
      {SPACE}ALL RIGHTS RESERV
      ED
BM 20 IFPEEK(65530)=5THENBANK1
      5
KK 30 GOSUB370
AC 40 PRINT"{CLR}{BLK}
      {3 SPACES}COPYRIGHT 1988
       COMPUTE! PUB., INC."
PA 50 PRINTTAB(10)"ALL RIGHTS
      {SPACE}RESERVED"
SE 60 Z$="U":PRINT"{HOME}
      {5 DOWN}"TAB(29)Z$:PRINT
      "{UP}";
KX 70 INPUT" UPPER OR LOWER CA
      SE? (U/L)";Z$:IFZ$<>"L"A
      NDZ$<>"U"THEN60
AS 80 Z=0:IFZ$="L"THENZ=1
JE 90 POKECS,Z:PRINT"{DOWN} PR
      ESS {RVS}RETURN{OFF} WHE
      N DONE{DOWN}"
GE 100 N=0:OPEN15,8,15
CK 110 N$="":INPUT" FILENAME";
      N$:IFN$=""THEN170
CX 120 IFLEN(N$)>16THEN110
KQ 130 OPEN2,8,2,N$+",P,R":INP
      UT#15,E1,E2$,E3,E4
SA 140 CLOSE2:IFE1>19THENPRINT
      " ***"E1;E2$;E3;E4:GOTO
      110
KX 150 N$=N$+"{16 SPACES}"
PK 160 FORI=0TO15:Z$=MID$(N$,I
      +1,1):Z=ASC(Z$):POKEBU+
      N*16+I,Z:NEXT:N=N+1:GOT
      O110
CG 170 CLOSE15:IFN=0THEN200
RR 180 POKENL,N-1:POKELN,0:POK
      ECC,PEEK(CO):GOTO220
QQ 190 REM EXIT
KE 200 PRINT"{CLR}{DOWN} MULTI
      LIST COMPLETED":END
RJ 210 REM RUN-TIME CODE
AP 220 GOSUB370:POKECO,PEEK(CC
      ):N=PEEK(LN):IFN>PEEK(N
      L)THEN200
FM 230 N$="":FORI=0TO15:Z=PEEK
      (BU+N*16+I):Z$=CHR$(Z):
      N$=N$+Z$:NEXT
HH 240 IFRIGHT$(N$,1)=" "THENN
      $=LEFT$(N$,LEN(N$)-1):G
      OTO240
MC 250 PRINT"{CLR} NOW PRINTIN
      G: "N$
RB 260 POKECC,PEEK(CO):POKECO,
      PEEK(SC):N=N+1:POKELN,N
BR 270 Z$="":Z=PEEK(CS):IFZTHE
      NZ$=",7"
AJ 280 PRINT"{HOME}{2 DOWN}Z=P
      EEK(Q):Z=Z+7:POKEQ,Z:PO
      KE(Z*256+PEEK(Q-1)-1),0
      :CLR"
RP 290 PRINT"{2 DOWN}LOAD"CHR$
      (34)N$CHR$(34)",8"
JE 300 PRINT"{4 DOWN}OPEN4,4"Z
      $":CMD4:LIST"
ES 310 PRINT"PRINT#4,CHR$(12);
      ":REM FF CODE
XJ 320 PRINT"{2 DOWN}CLOSE4"
XH 330 PRINT"{2 DOWN}Q=PEEK(15
      5):Z=PEEK(Q):Z=Z-7:POKE
      Q,Z:POKE(Z*256+PEEK(Q-1
      )-1),0:CLR"
HM 340 PRINT"{2 DOWN}RUN220
      {HOME}";
FE 350 FORI=0TO6:POKEKB+I,13:N
      EXT:POKENDX,I:END
GE 360 REM SET ADDRESSES
CJ 370 IFPEEK(65530)<>164THEN4
      10
KH 380 IFPEEK(56)>63THENPOKE56
      ,244:POKE55,0:POKE52,24
      4:POKE51,0:GOTO400
MB 390 POKE56,62:POKE55,0:POKE
      52,62:POKE51,0
AD 400 CO=1339:BU=PEEK(56)*256
      :NL=819:SC=65301:NDX=23
      9:KB=1319:Q=44:GOTO430
CG 410 CO=646:BU=49152:NL=828:
      SC=53281:NDX=198:KB=631
      :Q=44
QA 420 IFPEEK(65530)=5THENCO=2
      41:BU=4864:NL=2816:NDX=
      208:KB=842:Q=46
FE 430 LN=NL+1:CC=NL+2:CS=NL+3
      :BC=NL+4:POKE155,Q:RETU
      RN
```

Turbo *SpeedScript*

Article on page 77.

Program 1: TURBO SS

```
QD 1 REM COPYRIGHT 1988 COMPUT
     E! PUBLICATIONS, INC. - A
     LL RIGHTS RESERVED
PR 2 PRINT"{CLR}{BLK}
     {3 SPACES}COPYRIGHT 1988
     {SPACE}COMPUTE! PUB., INC
     ."
ER 3 PRINTTAB(10)"ALL RIGHTS R
     ESERVED":FORI=1TO2000:NEX
     T
MP 4 OPEN4,4,10:CLOSE4:IFST=0T
     HENPRINT"{CLR}{DOWN}{RVS}
     {WHT}TURN PRINTER OFF.
     {OFF}":GOTO4
JX 5 PRINT"{BLK}":POKE53280,0:
     POKE53281,0
XG 6 PRINT"{CLR}LOAD"CHR$(34)"
     TURBODISK"CHR$(34)",8,1"
DB 7 PRINT"{4 DOWN}NEW:REM
     {4 SPACES}{WHT}BLINK 5 TI
     MES.{BLK}"
PF 8 PRINT"{2 DOWN}?"CHR$(34)"
     {2 UP}"CHR$(34)":SYS49152
     :LOAD"CHR$(34)"TURBOSAVE"
     CHR$(34)",8"
BM 9 PRINT"{3 DOWN}SYS2061
     {3 DOWN}LOAD"CHR$(34)"SPE
     EDSCRIPT"CHR$(34)",8"
PM 10 PRINT"{2 DOWN}POKE44,64:
     POKE16384,0:?"CHR$(34)"
     {UP}"CHR$(34)";:NEW"
XM 11 PRINT"{DOWN}?"CHR$(34)"
     {2 UP}"CHR$(34)":LOAD"CH
     R$(34)"ALTER*"+CHR$(34)"
     ,8{2 DOWN}RUN";
RA 12 POKE631,19:POKE632,13:PO
     KE633,13:POKE634,13:POKE
     635,13:POKE636,13:POKE63
     7,13
GS 13 POKE638,13:POKE639,13:PO
     KE198,9
```

Program 2: ALTER SPDSCRPT

```
QH 1 DATA 4,170,160,10,32,186,
     255,169,0,32,189,255,32,1
     92,255,32,236,30,240,7,23
     4
CK 2 DATA 169,4,32,195,255,162
     ,8,160,0,32,183,255,132,1
     44,201,128,24,96,234
XA 3 A=4898:B=4918:GOSUB5:A=79
     16:B=7934:GOSUB5
DA 4 POKE2481,160:POKE4938,8:P
     OKE44,8:RUN
AK 5 FORI=ATOB:READC:POKEI,C:N
     EXT:RETURN
```

Impossible Borders

Article on page 78.

Program 1: Bouncy Borders

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
GD 20 PRINT"{CLR}{BLK}
      {3 SPACES}COPYRIGHT 1988
       COMPUTE! PUB., INC."
QP 30 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED{DOWN}"
PQ 40 GOSUB62000
KE 50 PRINT"{CLR}":SYS49152:PR
      INT
RJ 60 PRINTSPC(13)"BOUNCY
      {2 SPACES}BORDER"
BQ 70 PRINTSPC(13)"PRESS [RETU
      RN]"
EG 80 GETA$:IFA$<>CHR$(13)THEN
      80
XJ 90 SYS49155:END
KD 62000 FORI=49152TO49398:REA
         DA:POKEI,A:X=X+A:NEXT
JR 62010 IFX<>36101THENPRINT"
         {DOWN}DATA STATEMENT
         {SPACE}ERROR.":STOP
FC 62020 RETURN
EP 62030 DATA 24,144,21,120,32
         ,132,255,32,129,255,1
         73,231,192,141,20,3
DH 62040 DATA 173,232,192,141,
         21,3,88,96,120,169,12
         7,141,13,220,173,13
BA 62050 DATA 220,173,20,3,141
         ,231,192,173,21,3,141
         ,232,192,169,113,141
RC 62060 DATA 20,3,169,192,141
         ,21,3,173,17,208,41,1
         27,141,17,208,169
HC 62070 DATA 242,141,233,192,
         141,18,208,169,244,14
         1,245,192,169,246,141
         ,246
CP 62080 DATA 192,169,248,141,
         247,192,169,250,141,2
         48,192,169,0,141,238,
```

```
          192
AK 62090  DATA 169,248,141,244,
          192,169,129,141,26,20
          8,169,143,141,25,208,
          88
RA 62100  DATA 96,120,172,238,1
          92,185,239,192,141,32
          ,208,200,140,238,192,
          192
RG 62110  DATA 5,240,17,185,233
          ,192,141,18,208,169,1
          43,141,25,208,104,168
FG 62120  DATA 104,170,104,64,1
          73,233,192,201,242,14
          4,7,169,252,141,244,1
          92
AH 62130  DATA 208,9,201,55,176
          ,5,169,4,141,244,192,
          173,233,192,24,109
QC 62140  DATA 244,192,141,233,
          192,141,18,208,173,17
          ,208,41,127,141,17,20
          8
GP 62150  DATA 169,250,56,237,2
          33,192,74,74,141,245,
          192,160,1,173,233,192
AF 62160  DATA 24,109,245,192,1
          53,233,192,200,192,4,
          208,244,169,0,141,238
QP 62170  DATA 192,169,143,141,
          25,208,76,49,234,242,
          244,246,248,250,0,2
BX 62180  DATA 5,14,8,0,248,0,1
          70
```

Program 2: Expanding Borders

```
HE 10 REM COPYRIGHT 1988 COMPU
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       ALL RIGHTS RESERVED
GD 20 PRINT"{CLR}{BLK}
      {3 SPACES}COPYRIGHT 1988
       COMPUTE! PUB., INC."
QP 30 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED{DOWN}"
PQ 40 GOSUB62000
KE 50 PRINT"{CLR}":SYS49152:PR
      INT
XD 60 PRINTSPC(12)"EXPANDING B
      ORDER"
BQ 70 PRINTSPC(13)"PRESS [RETU
      RN]"
EG 80 GETA$:IFA$<>CHR$(13)THEN
      80
XJ 90 SYS49155:END
QC 62000 FORI=49152TO49414:REA
         DA:POKEI,A:X=X+A:NEXT
FC 62010 IFX<>34547THENPRINT"
         {DOWN}DATA STATEMENT
         {SPACE}ERROR.":STOP
FC 62020 RETURN
PE 62030 DATA 24,144,21,120,32
         ,132,255,32,129,255,1
         73,239,192,141,20,3
CE 62040 DATA 173,240,192,141,
         21,3,88,96,120,169,12
         7,141,13,220,173,13
CF 62050 DATA 220,173,20,3,141
         ,239,192,173,21,3,141
         ,240,192,169,106,141
RC 62060 DATA 20,3,169,192,141
         ,21,3,173,17,208,41,1
         27,141,17,208,169
RD 62070 DATA 142,141,241,192,
         141,18,208,160,1,24,1
         05,2,153,241,192,200
CP 62080 DATA 192,9,208,245,16
         9,0,141,250,192,169,2
         52,141,4,193,169,129
PR 62090 DATA 141,26,208,169,1
         43,141,25,208,88,96,1
         20,172,250,192,185,25
         1
HP 62100 DATA 192,141,32,208,2
         00,140,250,192,192,9,
         240,17,185,241,192,14
         1
GC 62110 DATA 18,208,169,143,1
         41,25,208,104,168,104
         ,170,104,64,173,241,1
         92
AA 62120 DATA 201,142,144,7,16
         9,252,141,4,193,208,9
         ,201,55,176,5,169
MG 62130 DATA 4,141,4,193,173,
         241,192,24,109,4,193,
         141,241,192,141,18
PR 62140 DATA 208,173,17,208,4
         1,127,141,17,208,169,
         150,56,237,241,192,74
DK 62150 DATA 74,141,6,193,160
         ,1,173,241,192,24,109
         ,6,193,153,241,192
MJ 62160 DATA 200,192,4,208,24
         4,200,169,150,24,109,
         6,193,153,241,192,200
DR 62170 DATA 192,9,208,244,16
         9,0,141,250,192,169,1
         43,141,25,208,76,49
XS 62180 DATA 234,142,144,146,
         148,150,152,154,156,1
         58,0,2,5,14,8,9
HX 62190 DATA 7,3,4,0,248,8,0
```

Program 3: Rainbow Borders

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
GD 20 PRINT"{CLR}{BLK}
      {3 SPACES}COPYRIGHT 1988
       COMPUTE! PUB., INC."
QP 30 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED{DOWN}"
PQ 40 GOSUB62000
KE 50 PRINT"{CLR}":SYS49152:PR
      INT
XH 60 PRINTSPC(13)"RAINBOW BOR
      DER"
BQ 70 PRINTSPC(13)"PRESS [RETU
      RN]"
EG 80 GETA$:IFA$<>CHR$(13)THEN
      80
XJ 90 SYS49155:END
GB 62000 FORI=49152TO49313:REA
         DA:POKEI,A:X=X+A:NEXT
QQ 62010 IFX<>20045THENPRINT"
         {DOWN}DATA STATEMENT
         {SPACE}ERROR.":STOP
FC 62020 RETURN
DP 62030 DATA 24,144,21,120,32
         ,132,255,32,129,255,1
         73,141,192,141,20,3
EH 62040 DATA 173,142,192,141,
         21,3,88,96,120,169,12
         7,141,13,220,173,13
MQ 62050 DATA 220,173,20,3,141
         ,141,192,173,21,3,141
         ,142,192,169,86,141
RC 62060 DATA 20,3,169,192,141
         ,21,3,173,17,208,41,1
         27,141,17,208,169
QA 62070 DATA 50,141,18,208,14
         1,160,192,141,161,192
         ,169,129,141,26,208,1
         69
EX 62080 DATA 143,141,25,208,8
         8,96,120,238,161,192,
         173,17,208,41,127,141
XA 62090 DATA 17,208,173,160,1
         92,24,105,6,141,160,1
         92,141,18,208,176,4
FM 62100 DATA 201,250,144,27,1
         69,0,234,141,32,208,1
         69,50,141,18,208,141
PA 62110 DATA 160,192,169,1,14
         1,161,192,169,143,141
         ,25,208,76,49,234,173
JH 62120 DATA 161,192,141,32,2
         08,169,143,141,25,208
         ,104,168,104,170,104,
         64
ES 62130 DATA 0,0
```

Program 4: Yo-Yo Borders

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
GD 20 PRINT"{CLR}{BLK}
      {3 SPACES}COPYRIGHT 1988
       COMPUTE! PUB., INC."
QP 30 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED{DOWN}"
PQ 40 GOSUB62000
KE 50 PRINT"{CLR}":SYS49152:PR
      INT
KS 60 PRINTSPC(14)"YOYO BORDER
      "
BQ 70 PRINTSPC(13)"PRESS [RETU
      RN]"
EG 80 GETA$:IFA$<>CHR$(13)THEN
      80
XJ 90 SYS49155:END
DC 62000 FORI=49152TO49399:REA
         DA:POKEI,A:X=X+A:NEXT
HJ 62010 IFX<>31552THENPRINT"
         {DOWN}DATA STATEMENT
         {SPACE}ERROR.":STOP
FC 62020 RETURN
AS 62030 DATA 24,144,21,120,32
         ,132,255,32,129,255,1
         73,232,192,141,20,3
DG 62040 DATA 173,233,192,141,
         21,3,88,96,120,169,12
         7,141,13,220,173,13
JQ 62050 DATA 220,173,20,3,141
         ,232,192,173,21,3,141
         ,233,192,169,98,141
RC 62060 DATA 20,3,169,192,141
         ,21,3,173,17,208,41,1
         27,141,17,208,169
GG 62070 DATA 50,141,18,208,16
         9,55,141,234,192,169,
         7,141,235,192,141,246
HD 62080 DATA 192,169,1,141,24
         5,192,169,129,141,26,
         208,169,143,141,25,20
         8
FC 62090 DATA 88,96,120,173,17
         ,208,41,127,141,17,20
         8,173,234,192,24,109
DQ 62100 DATA 245,192,141,234,
         192,141,18,208,201,55
         ,176,37,169,1,141,245
RF 62110 DATA 192,238,235,192,
         173,235,192,41,7,168,
         173,33,208,41,15,217
XB 62120 DATA 236,192,208,4,20
         0,238,235,192,185,236
         ,192,141,246,192,56,1
         76
PE 62130 DATA 9,201,250,144,5,
         169,255,141,245,192,1
         73,246,192,141,32,208
PS 62140 DATA 169,197,141,20,3
         ,169,192,141,21,3,169
         ,143,141,25,208,104
SC 62150 DATA 168,104,170,104,
         64,120,173,17,208,41,
         127,141,17,208,169,50
QB 62160 DATA 141,18,208,169,0
         ,141,32,208,169,98,14
         1,20,3,169,192,141
AX 62170 DATA 21,3,169,143,141
         ,25,208,76,49,234,132
         ,0,6,5,2,14
JX 62180 DATA 13,10,8,7,15,0,0
         ,170
```

Fire!

Article on page 46.

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
XC 20 POKE56,48:POKE55,0:CLR:P
      OKE53280,15:POKE53281,15
PC 30 PRINT"{CLR}{BLK}
      {3 SPACES}COPYRIGHT 1988
       COMPUTE! PUB., INC."
AA 40 PRINTTAB(10)"ALL RIGHTS
      {SPACE}RESERVED"
AS 50 FORI=1TO191:READA:X=X+A:
      NEXT
PK 60 IFX<>17240THENPRINT"ERRO
      R IN DATA STATEMENTS.":S
      TOP
MD 70 RESTORE:FORI=679TO725:RE
      ADA:POKEI,A:NEXT:X=RND(-
      TI)
MX 80 DATA 120,165,1,41,251,13
      3,1,169,208,133
EM 90 DATA 252,169,48,133,254,
      169,0,133,251,133
JC 100 DATA 253,162,8,160,0,17
      7,251,145,253,200
BH 110 DATA 208,249,230,252,23
      0,254,202,208,242,165
HQ 120 DATA 1,9,4,133,1,88,96
AM 130 X=0:FORN=12288TO12298:X
      =X+PEEK(N):NEXT:IFX<>82
      2THENGOSUB1460
CC 140 DIM P%(9):POKE53272,29
RE 150 D$="{HOME}{26 DOWN}":TU
      $="02010201935251727172
      7126"
BH 160 BF$="{RVS}@@@@@@@@@@@@@
      @@":FL$="{RVS}AAAAAAAAA
      AAAAA"
FH 170 UU$="WHOOPS...UH-OH...
      {SPACE}EEK!!!{3 SPACES}
      OH, NO!{2 SPACES}OUCH!!
      !{2 SPACES}LOOK OUT!STO
      P!{4 SPACES}"
AX 180 UU$=UU$+"DROP!
      {4 SPACES}ROLL!
      {4 SPACES}HELP!!!
      {2 SPACES}"
HF 190 B$="U*********I{DOWN}
      {11 LEFT}-{9 SPACES}-
      {DOWN}{11 LEFT}J*{R3}***
      ****K"
CH 200 B$=B$+"{DOWN}{11 LEFT}*
      *K"
XB 210 BS$="{11 SPACES}{DOWN}
      {11 LEFT}{11 SPACES}
      {DOWN}{11 LEFT}
      {11 SPACES}"
RB 220 BS$=BS$+"{DOWN}
      {11 LEFT}{3 SPACES}"
HP 230 S=54272:FORN=STO54295:P
      OKEN,0:NEXT:POKEN,15:RE
      M SETUP SOUND
DX 240 POKES+2,0:POKES+3,8:POK
      ES+5,15:POKES+6,255
BR 250 PP=4000:FORN=0TO9:P%(N)
      =PP:PP=PP*2↑(1/12):NEXT
SA 260 REM INIT SPRITES
GX 270 X1=53248:Y1=53249:X2=53
      250:Y2=53251
QM 280 POKEX1,0:POKEY1,170:POK
      EX2,0:POKEY2,184:POKE53
      264,3
CF 290 POKE53287,15:POKE53288,
      15:POKE53277,1:POKE5327
      1,1:POKE2040,14:POKE204
      1,13
RD 300 REM PICK TYPE
AR 310 PRINT"{CLR}{BLK}
      {2 DOWN}PICK THE TYPE O
      F PROBLEMS YOU WANT:"
AA 320 PRINT"{3 DOWN}{4 RIGHT}
      (1) ADDITION":PRINT"
      {DOWN}{4 RIGHT}(2) SUBT
      RACTION"
PG 330 PRINT"{DOWN}{4 RIGHT}(3
      ) MULTIPLICATION":PRINT
      "{DOWN}{4 RIGHT}(4) DIV
      ISION":POKE198,0
FG 340 GETT$:IFT$<"1"ORT$>"4"T
      HEN340
AX 350 REM PICK LEVEL
EH 360 PRINT"{CLR}{2 DOWN}PICK
       THE LEVEL OF DIFFICULT
      Y:"
QM 370 PRINT"{3 DOWN}{4 RIGHT}
      (1) BEGINNER":PRINT"
      {DOWN}{4 RIGHT}(2) INTE
      RMEDIATE"
AP 380 PRINT"{DOWN}{4 RIGHT}(3
      ) EINSTEIN":POKE198,0
BF 390 GETWH$:IFWH$<"1"ORWH$>"
      3"THEN390
SH 400 WH=15+(4-VAL(WH$))*15
KS 410 PRINT"{CLR}{10 DOWN}YOU
       WILL HAVE"WH"SECONDS T
      O PUT OUT THE {DOWN}FIR
      E...."
SA 420 PRINT"{4 DOWN}PRESS
      {RVS}RETURN{OFF} TO STA
      RT....":POKE198,0
JR 430 GETA$:IFA$<>CHR$(13)THE
      N430
SE 440 REM MAIN LOOP
SD 450 PRINT"{CLR}":GOSUB570:T
      I$="000000":PR=1
PX 460 GOSUB810
FC 470 PRINTLEFT$(D$,6+PR)SPC(
      9)"{BLK} "X$" "O$" "Y$"
       "
QD 480 FL=0:GOSUB980
JD 490 IFFL=1THENGOSUB1180:GOT
      O520
XB 500 PR=PR+1:IFPR<11THEN460
FK 510 GOSUB1290
EF 520 PRINT"{HOME}{2 DOWN}{13}
      PLAY AGAIN?{2 SPACES}(Y
      /N)":POKE198,0
QC 530 GETA$:IFA$="N"THENPOKE5
      3269,0:PRINT"{CLR}
      {2 DOWN}":END
MQ 540 IFA$<>"Y"THEN530
FA 550 POKE53269,0:PRINT"{CLR}
      ":GOTO260
KP 560 REM INIT SCENE
GR 570 GOSUB1390:PRINTLEFT$(D$
      ,17)SPC(5)"{43}{RVS}
      {3 SPACES}A{11 SPACES}"
CM 580 PRINTLEFT$(D$,7):FORN=
      1TO10:PRINTSPC(5)"{43}"F
      L$:NEXT:DE=60:GOSUB1140
EE 590 FORN=10TO1STEP-1:POKES+
      4,129:FORZ=4TO20:POKES+
      1,Z:NEXT
HK 600 PRINTLEFT$(D$,N+6)SPC(5
      )"{13}"BF$:POKES+1,0:DE=
      5:GOSUB1140
XP 610 PRINTLEFT$(D$,N+3)SPC(2
      0)"{BLK}"B$
EQ 620 PRINTLEFT$(D$,N+4)SPC(2
      1)"{23}"MID$(UU$,(11-N-1
      )*9+1,9):DE=20:GOSUB114
      0
RR 630 PRINTLEFT$(D$,N+3)SPC(2
      0)BS$:NEXT
DR 640 REM ENTER TRUCK
MD 650 POKES+4,65:POKE53264,3:
      POKE53269,3:POKEX1,140:
      POKEX2,140:POKE53287,7
AC 660 POKE53288,2:FORX=400TO2
      00STEP-2:XX=X:IFXX>255T
      HENXX=XX-255
EQ 670 IFXX>=254THENPOKE53264,
      2
HK 680 POKEX1,XX:XX=X+32:IFXX>
      255THENXX=XX-255
GC 690 IFXX>=254THENPOKE53264,
      0
RA 700 POKEX2,XX:SN=SN+1:IFSN<
      7THENPOKES+1,30
QQ 710 IFSN>6THENPOKES+1,23
KC 720 IFSN>12THENSN=0
HF 730 NEXT:POKES+1,0
PA 740 REM LADDER UP
DG 750 FORN=18TO7STEP-1:PRINTL
      EFT$(D$,N)SPC(24)"{53}
      {RVS}A":POKES+1,240-10*
      N:NEXT
QX 760 POKES+1,0:POKES+4,16
FD 770 REM FIREMAN UP
BB 780 POKEX2,208:FORN=164TO92
      STEP-1:POKEY2,N:POKES+1
      ,180-N:NEXT:POKES+1,0
RS 790 POKES+4,16:RETURN
RM 800 REM GENERATE PROBLEM
KH 810 ONVAL(T$)GOSUB840,860,8
      90,910
SG 820 X$=MID$(STR$(X),2):Y$=M
      ID$(STR$(Y),2):RETURN
SG 830 REM ADDITION
AG 840 GOSUB940:O$="+":AQ$=STR
      $(X+Y):GOSUB960:RETURN
AE 850 REM SUBTRACTION
PF 860 GOSUB940:IFY>XTHEN860
DP 870 K=X+Y:AQ$=STR$(X):GOSUB
      960:X=K:O$="-":RETURN
CH 880 REM MULTIPLICATION
JF 890 GOSUB940:O$="X":AQ$=STR
      $(X*Y):GOSUB960:RETURN
GE 900 REM DIVISION
HQ 910 GOSUB940:IFX=0ORY=0THEN
      910
CC 920 K=X*Y:AQ$=STR$(X):GOSUB
      960:X=K:O$="/":RETURN
RH 930 REM GENERATE TWO VALUES
EA 940 X=INT(RND(1)*10):Y=INT(
      RND(1)*10):RETURN
PM 950 REM PRUNE STRING
HC 960 AQ$=MID$(AQ$,2):RETURN
DG 970 REM GET ANSWER
GA 980 AN$="":POKE198,0
XM 990 GETA$:PRINTLEFT$(D$,22)
      "{GRN}TIME: "RIGHT$(TI$
      ,2)
QK 1000 IFVAL(RIGHT$(TI$,3))>W
      HTHENFL=1:RETURN
AC 1010 IFA$=CHR$(13)THEN1040
BP 1020 IFA$<"0"ORA$>"9"THEN99
      0
HD 1030 AN$=AN$+A$:PRINTLEFT$(
      D$,PR+6)SPC(21)"{RVS}
      {13}"AN$:IFLEN(AN$)<3TH
      EN990
QQ 1040 IFAN$=AQ$THENGOSUB1090
      :RETURN
KX 1050 PRINTLEFT$(D$,PR+6)SPC
      (30)"{BLK}{RVS}NO!!!":
      POKES+4,33:POKES+1,10:
      DE=20:GOSUB1140
MM 1060 POKES+1,0:POKES+4,32:P
      RINTLEFT$(D$,PR+6)SPC(
      30)"{5 SPACES}"
SC 1070 PRINTLEFT$(D$,PR+6)SPC
      (21)"{3 SPACES}":GOTO9
      80
KG 1080 REM RIGHT
AA 1090 PRINTLEFT$(D$,PR+6)SPC
      (20)"{73}****"
PE 1100 POKES+4,129:POKES+1,90
      :DE=20:GOSUB1140:POKES
      +4,128:POKES+1,0
GE 1110 PRINTLEFT$(D$,PR+6)SPC
      (20)"{4 SPACES}"
HD 1120 PRINTLEFT$(D$,PR+6)SPC
      (5)"{43}"FL$:POKEY2,PEE
```

```
        K(Y2)+8:RETURN
CE 1130 REM DELAYS
PQ 1140 TT=TI
GC 1150 IFTI-DE<TTTHEN1150
DJ 1160 RETURN
RC 1170 REM BURN IT DOWN
CA 1180 PRINTLEFT$(D$,22)"
        {GRN}{RVS}OOPS... TOO
        {SPACE}LONG!!!":POKES+
        4,129
JS 1190 FORN=10TO1STEP-1:POKES
        +1,210-N*20
KJ 1200 PRINTLEFT$(D$,N+6)SPC(
        5)"£1£"BF$:POKES+1,0:N
        EXT:DE=60:GOSUB1140
HK 1210 FORN=20TO0STEP-1:POKES
        +1,N*10
CQ 1220 PRINTLEFT$(D$,21-N)SPC
        (5)"{15 SPACES}";:NEXT
JM 1230 PRINTLEFT$(D$,17)SPC(5
        )"£5£ {RVS}£{BLK}
        {12 SPACES}£5££*£{OFF}
        "
CP 1240 PRINTLEFT$(D$,18)SPC(5
        )"£5£{RVS}£ {BLK}
        {12 SPACES}£5£ £*£"
AS 1250 PRINTLEFT$(D$,19)SPC(5
        )"{BLK}£16 T£"
HM 1260 FORN=1TO8:X=INT(RND(1)
        *10)+8:Y=INT(RND(1)*11
        )+6
CR 1270 PRINTLEFT$(D$,Y)SPC(X)
        "@":DE=10:GOSUB1140:NE
        XT:RETURN
XE 1280 REM ALL 10
JH 1290 POKES+4,65:FORN=1TOLEN
        (TU$)/2:P$=MID$(TU$,(N
        -1)*2+1,2)
SE 1300 P=VAL(LEFT$(P$,1)):DE=
        VAL(RIGHT$(P$,1))*3
CQ 1310 P=P%(P):P1=INT(P/256):
        P2=P-256*P1
FP 1320 POKES,P2:POKES+1,P1:FO
        RP=1TODE*20:NEXT
KJ 1330 POKES,0:POKES+1,0:FORP
        =1TODE:NEXT:NEXT:POKES
        +4,64
SS 1340 PRINTLEFT$(D$,5)SPC(20
        )"{RED}"B$
FH 1350 PRINTLEFT$(D$,6)SPC(21
        )"YAY!!!":POKES+4,129:
        FORN=0TO15STEP.1
HF 1360 POKE54296,N:POKES+1,10
        :NEXT:FORN=15TO1STEP-.
        05:POKE54296,N:NEXT
DH 1370 POKES+1,0:POKES+4,128:
        POKE54296,15:RETURN
EB 1380 REM SHOW LEVEL
HB 1390 PRINT"{HOME}{DOWN}"SPC
        (20)"£2£{RVS}LEVEL:";
SX 1400 IFWH$="1"THENPRINT"
        £1£{2 SPACES}BEGINNER
        {3 SPACES}"
JF 1410 IFWH$="2"THENPRINT"
        £1£{2 SPACES}INTERMED.
        {2 SPACES}"
FB 1420 IFWH$="3"THENPRINT"
        £1£{2 SPACES}EINSTEIN
        {3 SPACES}"
HP 1430 PRINT"{HOME}{2 DOWN}"S
        PC(20)"£2£{RVS}TIME LI
        MIT:";
FQ 1440 PRINT"{RVS}£1£"WH"
        {LEFT} SEC. ":RETURN
DP 1450 REM DEFINE SPRITES & 2
         CHARS
PG 1460 FORN=0TO64*2-1:READA:P
        OKE832+N,A:NEXT
XF 1470 SYS679:FORN=0TO15:READ
        A:POKE12288+1024+N,A:N
        EXT:RETURN
FF 1480 REM SPRITE DATA
XF 1490 DATA0,30,0,0,63,0,0,12
        7
XG 1500 DATA224,0,18,16,0,34,0
        ,0
MP 1510 DATA18,0,0,12,0,0,30,0
DD 1520 DATA0,63,0,7,255,0,7,2
        39
JK 1530 DATA0,7,223,0,0,127,0,
        0
RF 1540 DATA127,0,0,127,0,0,12
        7,0
SB 1550 DATA0,54,0,0,54,0,0,54
KA 1560 DATA0,0,54,0,0,126,0,1
        84
MM 1570 DATA0,0,0,0,0,0,0,0
HM 1580 DATA0,0,0,0,0,0,0,0
AK 1590 DATA0,0,0,0,0,0,0,0
KG 1600 DATA0,0,0,0,0,0,30,0
HD 1610 DATA0,50,255,254,98,85
        ,84,194
BQ 1620 DATA85,84,255,255,254,
        255,137,255
KG 1630 DATA255,186,255,243,15
        4,231,204,185
KK 1640 DATA153,18,255,164,12,
        0,24,0
CH 1650 REM CHAR DATA
AF 1660 DATA146,214,215,247,24
        7,254,252,060
RG 1670 DATA255,129,129,129,12
        9,129,129,255
```

Easy Load

Article on page 75.

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
BM 20 IFPEEK(65530)=5THENBANK1
      5
PC 30 PRINT"{CLR}{BLK}
      {3 SPACES}COPYRIGHT 1988
       COMPUTE! PUB., INC."
FB 40 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED"
QR 50 PRINTTAB(6)"{3 DOWN}
      {RVS}EASY LOAD FILENAME
      {SPACE}CONVERTER"
PB 60 PRINT"{DOWN}(SINCE THE A
      DD-ONS BECOME PART OF TH
      E"
KM 70 PRINT"FILENAME, THE ENTI
      RE NAME MUST BE 16":PRIN
      T"CHARACTERS OR LESS.)"
RM 80 PRINT"{DOWN}ENTER $ AT T
      HE FILENAME PROMPT TO LI
      ST"
MG 90 PRINT"THE DIRECTORY, OR
      {SPACE}E TO EXIT THE PRO
      GRAM."
JD 100 INPUT"FILENAME (OR $ OR
        E) ";A$
DB 110 IFA$="E"THENPRINT"{CLR}
       ":END
CD 120 IFA$="$"THENGOSUB240:GO
       TO100
JK 130 PRINTTAB(4)"{DOWN}1 - T
       O ADD ',8:' (ADDS 4 CHA
       RS)"
JC 140 PRINTTAB(4)"2 - TO ADD
       {SPACE}',8,1' (ADDS 5 C
       HARS)"
BB 150 PRINTTAB(4)"3 - TO ABOR
       T{DOWN}"
DP 160 INPUT"ENTER CHOICE (1-3
       )";CHOICE:L=LEN(A$):IFC
       HOICE=3THENPRINT:GOTO10
       0
DR 170 GOSUB390:IFCHOICE=1ANDL
       >12ORCHOICE=2ANDL>11THE
       NGOSUB390:GOSUB290
SJ 180 IFCHOICE=1THENOPEN15,8,
       15,"R:"+A$+" £D£8£@=:"+A
       $:CLOSE15
JR 190 IFCHOICE=2THENOPEN15,8,
       15,"R:"+A$+" £D£8£D£1=:
       "+A$:CLOSE15
SJ 200 GOSUB370:PRINT"ANOTHER
       {SPACE}FILENAME? (Y/N)"
RF 210 GETP$:IFP$=""THEN210
CH 220 IFP$="Y"THENPRINT:GOTO1
       00
RB 230 PRINT"{CLR}":END
KQ 240 OPEN1,8,0,"$0":PRINT"
       {CLR}{RVS}";
FC 250 GET#1,B$:IFST<>0THEN280
RC 260 IFB$<>CHR$(34)THEN250
XM 270 PRINTB$;:FORI=1TO17:GET
       #1,B$:PRINTB$;:NEXTI:PR
       INT:IFST=0THEN250
MA 280 CLOSE1:GOSUB370:RETURN
HB 290 D=12+(CHOICE=2):G$="CHA
       RACTERS":D=L-D:IFD=1THE
       NG$=LEFT$(G$,9)
RF 300 PRINT"{DOWN}FILENAME TO
       O LONG BY"D;G$"."
RC 310 PRINT"WOULD YOU LIKE TO
        SHORTEN IT (Y/N)?"
KX 320 GETP$:IFP$=""THEN320
HQ 330 IFP$<>"Y"THENRUN
QB 340 PRINT"{DOWN}OLDNAME:"A$
       :INPUT"NEWNAME:";B$
PS 350 OPEN15,8,15,"R:"+B$+"="
       +A$:CLOSE15:A$=B$:GOSUB
       370:RETURN
KF 360 REM READ ERROR CHANNEL
JQ 370 OPEN15,8,15:INPUT#15,E1
       $,E2$,E3$,E4$:PRINT"
       {DOWN}"E1$" "E2$:CLOSE1
       5:RETURN
MB 380 REM GONG
GC 390 IFPEEK(65530)=164THEN43
       0
JF 400 S=54272:POKES+24,0:FORH
       =0TO24:POKES+H,0:NEXT
QE 410 POKES+1,60:POKES+5,9:PO
       KES+15,10:POKES+24,15:F
       ORH=1TO3
AK 420 POKES+4,21:FORT=1TO600:
       NEXT:POKES+4,20:FORT=1T
       O100:NEXT:NEXT:RETURN
RD 430 VOL7:FORI=1TO3:SOUND1,4
       40,8:FORJ=1TO200:NEXT:N
       EXT:RETURN
```

Function Key Magician

Article on page 73.

```
EK 10 DIMF$(16):REM COPYRIGHT
      {SPACE}1988 COMPUTE! PUB
      LICATIONS, INC. ALL RIGH
      TS RESERVED
GD 20 PRINT"{CLR}{BLK}
      {3 SPACES}COPYRIGHT 1988
       COMPUTE! PUB., INC."
MH 30 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED":GOSUB39
      0
PF 40 F$(1)="LOAD"+CHR$(34)
QB 50 F$(2)="SAVE"+CHR$(34)
SA 60 F$(3)="PRINT"+CHR$(34)
BF 70 F$(4)="PO53281,0:PO53280
      ,0:"+CHR$(152)+"LIST"+CH
      R$(13)
PK 80 F$(5)="GOTO"
JJ 90 F$(6)="GOSUB"
QM 100 F$(7)="FORI=1TO500:NEXT
       "
```

```
HH 110 F$(8)="LOAD"+CHR$(34)+"
       $"+CHR$(34)+",8"
RA 120 F$(9)="OPEN4,4:CMD4:LIS
       T"
XR 130 F$(10)="OPEN15,8,15,"+C
       HR$(34)+"V0"+CHR$(34)+"
       :CLOSE15"
KK 140 F$(11)="OPEN15,8,15,"+C
       HR$(34)+"I0"+CHR$(34)+"
       :CLOSE15"
PX 150 F$(12)="LIST0-150"+CHR$
       (13)
SG 160 F$(13)="LIST151-300"+CH
       R$(13)
EC 170 F$(14)="LIST300-450"+CH
       R$(13)
MX 180 F$(15)="LIST451-600"+CH
       R$(13)
QC 190 F$(16)="RUN"+CHR$(13)
GP 200 FORP=1TO16:L=LEN(F$(P))
       :FORI=1TOL
SQ 210 POKE51350+C,ASC(MID$(F$
       (P),I,1)):C=C+1:NEXT:PO
       KE51350+C,0:C=C+1:NEXT
XJ 220 PRINT"{CLR}{DOWN}ALL KE
       YS ARE DEFINED."
SK 230 INPUT"DO YOU WISH TO SA
       VE THIS VERSION
       {2 SPACES}Y{3 LEFT}";Q$
       :IFQ$="Y"THEN260
EE 240 IFQ$<>"N"THEN230
FH 250 PRINT"{CLR}":END
MM 260 INPUT"FILENAME";N$:L=LE
       N(N$):IFL<1ORL>16THEN26
       0
HE 270 PRINT"{DOWN}PLEASE WAIT
       ..."
MD 280 OPEN15,8,15,"I0":CLOSE1
       5:IFST<>0THEN370
JK 290 OPEN1,8,15:OPEN2,8,2,"0
       :"+N$+",P,W":IFST<>0THE
       N340
DS 300 PRINT#2,CHR$(0)CHR$(200
       );
BM 310 FORK=51200TO51350+C:PRI
       NT#2,CHR$(PEEK(K));:NEX
       T
EG 320 IFST<>0THEN340
CR 330 PRINT"SAVE COMPLETED.":
       GOTO350
DD 340 PRINT"{RED}ERROR:
       {2 SPACES}#63";
EX 350 GET#1,E$:PRINTE$;:IFE$<
       >CHR$(13)THEN350
HK 360 CLOSE1:CLOSE2:PRINT"
       {CLR}":SYS51200:END
KQ 370 PRINT"{RED}DISK ERROR:
       {2 SPACES}#63"
FC 380 PRINT"{2 RIGHT}INSERT D
       ISK AND PRESS A KEY.":W
       AIT198,15:GETA$:GOTO280
BQ 390 FORI=51200TO51349:READA
       :X=X+A:POKEI,A:NEXT
EH 400 IFX<>19573THENPRINT"ERR
       OR IN ML DATA STATEMENT
       S.":STOP
EX 410 RETURN
MP 420 DATA 169,124,160,200,32
       ,30,171,120,169,20
AF 430 DATA 141,20,3,169,200,1
       41,21,3,88,96
QC 440 DATA 165,197,201,64,208
       ,5,133,253,76,49
SD 450 DATA 234,197,253,240,24
       9,133,253,201,3,144
CP 460 DATA 243,201,7,176,239,
       41,3,133,254,173
FF 470 DATA 141,2,208,5,165,25
       4,76,65,200,170
RH 480 DATA 189,142,200,5,254,
       162,150,160,200,134
HB 490 DATA 251,132,252,160,0,
       170,240,17,177,251
GF 500 DATA 208,3,202,240,9,23
       0,251,208,245,230
XX 510 DATA 252,76,78,200,200,
       177,251,240,185,201
DF 520 DATA 13,240,11,32,210,2
       55,200,208,242,230
XG 530 DATA 252,76,95,200,141,
       119,2,162,1,134
DE 540 DATA 198,76,28,200,83,8
       5,80,69,82,75
RR 550 DATA 69,89,32,69,78,65,
       66,76,69,68
DF 560 DATA 46,0,0,4,8,0,12,0,
       0,0
```

Grand Pix

See instructions on page 76 before typing in.

Program 1: Epson Version

```
0334:A9 60 85 FC 20 CC FF A2 7E
033C:FF A0 FF 20 BD FF A9 04 B1
0344:AA A0 05 20 BA FF 20 C0 41
034C:FF A2 04 20 C9 FF A0 00 0D
0354:84 FB 84 02 84 FD 84 FE 70
035C:B9 EA 03 20 D2 FF C8 C0 45
0364:03 D0 F5 A2 00 A0 00 B1 3D
036C:FB 3D ED 03 F0 04 A9 23 BB
0374:D0 02 A9 20 20 D2 FF E8 CF
037C:E0 08 D0 EB A2 00 98 18 2C
0384:69 08 A8 C0 50 90 E0 A9 92
038C:0A 20 D2 FF E6 02 A5 02 86
0394:C9 08 F0 08 98 38 E9 4F E8
039C:A8 4C 6B 03 A0 00 84 02 B7
03A4:A5 FB 18 69 40 85 FB 90 B6
03AC:02 E6 FC E6 FC E6 FD A5 A0
03B4:FD C9 19 F0 03 4C 6B 03 81
03BC:A9 00 85 FD A5 FB 38 E9 9F
03C4:F0 85 FB B0 02 C6 FC A5 F9
03CC:FC 38 E9 1E 85 FC A9 0A FB
03D4:20 D2 FF 20 D2 FF E6 FE 05
03DC:A5 FE C9 04 90 89 20 CC A6
03E4:FF A9 04 4C C3 FF 1B 33 22
03EC:12 80 40 20 10 08 04 02 D0
03F4:01 00 00 00 00 00 00 00 7B
```

Program 2: Commodore 1525 Version

```
0334:A9 60 85 FC 20 CC FF A2 7E
033C:FF A0 FF 20 BD FF A9 04 B1
0344:AA A0 00 20 BA FF 20 C0 A0
034C:FF A2 04 20 C9 FF A0 00 0D
0354:84 FB 84 02 84 FD 84 FE 70
035C:A2 00 B1 FB 3D EB 03 F0 3A
0364:04 A9 23 D0 02 A9 20 20 5F
036C:D2 FF E8 E0 08 D0 EB A2 05
0374:00 98 18 69 08 A8 C0 50 EE
037C:90 E0 20 DB 03 E6 02 A5 22
0384:02 C9 08 F0 08 98 38 E9 0B
038C:4F A8 4C 5E 03 A0 00 84 F2
0394:02 A5 FB 18 69 40 85 FB 59
039C:90 02 E6 FC E6 FC E6 FD 0F
03A4:A5 FD C9 19 F0 03 4C 5E 52
03AC:03 A9 00 85 FD A5 FB 38 AD
03B4:E9 F0 85 FB B0 02 C6 FC 74
03BC:A5 FC 38 E9 1E 85 FC A9 25
03C4:0A 20 D2 FF 20 D2 FF E6 65
03CC:FE A5 FE C9 04 90 8B 20 D1
03D4:CC FF A9 04 4C C3 FF A9 D1
03DC:08 20 D2 FF A9 0A 20 D2 D1
03E4:FF A9 0F 20 D2 FF 60 80 11
03EC:40 20 10 08 04 02 01 00 C7
```

Program 3: Commodore 1526 Version

```
0334:A9 60 85 FC 20 CC FF A2 7E
033C:FF A0 FF 20 BD FF A9 06 B3
0344:A8 A2 04 20 BA FF 20 C0 A0
034C:FF A2 06 20 C9 FF A9 18 77
0354:20 D2 FF A9 06 20 C3 FF F1
035C:A9 04 AA A0 05 20 BA FF B5
0364:20 C0 FF A2 04 20 C9 FF 09
036C:A0 00 84 FB 84 02 84 FD 46
0374:84 FE A2 00 B1 FB 3D F7 C0
037C:03 F0 04 A9 23 D0 02 A9 65
0384:20 20 D2 FF E8 E0 08 D0 A8
038C:EB A2 00 98 18 69 08 A8 D9
0394:C0 50 90 E0 A9 0A 20 D2 B7
039C:FF E6 02 A5 02 C9 08 F0 2F
03A4:08 98 38 E9 4F A8 4C 78 A8
03AC:03 A0 00 84 02 A5 FB 18 5B
03B4:69 40 85 FB 90 02 E6 FC 47
03BC:E6 FC E6 FD A5 FD C9 19 04
03C4:F0 03 4C 78 03 A9 00 85 59
03CC:FD A5 FB 38 E9 F0 85 FB 58
03D4:B0 02 C6 FC A5 FC 38 E9 D7
03DC:1E 85 FC A9 0A 20 D2 FF 04
03E4:20 D2 FF E6 FE A5 FE C9 74
03EC:04 90 89 20 CC FF A9 04 0A
03F4:4C C3 FF 80 40 20 10 08 C4
03FC:04 02 01 00 00 00 00 00 A5
```

RADs

See instructions on page 48 before typing in.

```
0801:0B 08 0A 00 9E 32 30 36 2E
0809:31 00 00 00 4C A9 0B A2 73
0811:18 A9 00 9D 00 D4 CA 10 6A
0819:FA A9 0F 8D 18 D4 A9 FF 33
0821:8D 0F D4 A9 80 8D 12 D4 24
0829:60 8D EB 1B 8A 48 98 48 EA
0831:AC 7D 1D AE EB 1B B9 79 3E
0839:1D F0 05 DD FE 08 B0 3E 4A
0841:BD FE 08 99 79 1D BD 21 67
0849:09 99 70 1D BD 29 09 99 62
0851:76 1D BD 31 09 99 73 1D 61
0859:B9 16 09 A8 A9 00 99 04 FB
0861:D4 BD 0E 09 99 05 D4 BD E5
0869:19 09 99 06 D4 BD 21 09 C4
0871:99 01 D4 BD 06 09 99 04 90
0879:D4 49 01 99 04 D4 68 A8 EC
0881:68 AA 60 CE 6F 1D D0 FA F5
0889:A2 00 20 C3 08 A2 01 20 18
0891:C3 08 A0 01 A9 03 8D E8 07
0899:1B 8D 6F 1D B9 9F 1D 18 F8
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0979:A2 1D 38 E9 12 8D A4 1D F6
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09B9:FC 85 FC 18 69 D4 85 FE 75
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15C9:CA A9 A0 9D 98 07 B9 F1 F7
15D1:17 AA AD F3 17 9D 98 07 8E
15D9:CA CA A9 29 9D 98 07 88 C9
15E1:10 D8 60 BD B6 17 2D A5 44
15E9:1D F0 32 A9 01 9D 65 1D 26
15F1:BD 1F 16 9D 23 1C A9 02 3E
15F9:9D 12 1C A9 80 9D F6 1B 19
1601:A9 FF 9D 3C 1C A9 03 9D A4
1609:8E 1C 9D 86 1C A9 01 9D C6
1611:2C 1C 9D 44 1C 8A 0A 18 89
1619:69 80 9D F8 07 60 0D 1A 4B
1621:A9 01 20 2A 08 8E E8 1B 70
1629:BD F1 17 AA BD 98 07 C9 66
1631:31 90 0F DE 98 07 AD 19 3F
1639:1D 8D 6B 1D AE E8 1B 4C 32
1641:E4 15 A9 30 9D 98 07 AE 69
1649:E8 1B A9 FF 9D 2C 1C AD 69
1651:2C 1C C9 FF D0 0A AD 2D 0B
1659:1C C9 FF D0 03 8D 98 1C AE
1661:60 AD 9E 1D D0 0C A9 17 EF
1669:8D 96 16 A9 17 8D 97 16 93
1671:D0 0A A9 47 8D 96 16 A9 CE
1679:17 8D 97 16 A2 00 8E E8 04

1681:1B 8E E9 1B A9 07 8D 1A 6C
1689:1C A9 0F 8D 2B 1C 20 42 35
1691:09 AC E9 1B B9 E8 1B F0 F4
1699:1B C9 FF F0 16 29 3F 1D C5
16A1:99 1D AC E8 1B 91 FB A9 C6
16A9:00 91 FD EE E8 1B EE E9 64
16B1:1B D0 DE 60 EE 1A 1C EE 88
16B9:1A 1C 20 42 09 EE E9 1B 15
16C1:A9 00 8D E8 1B E8 8E EA 87
16C9:1B D0 C6 60 A9 01 8D 9D A0
16D1:1D A2 00 20 D7 09 AD 80 F5
16D9:1D D0 F6 A2 00 20 D7 09 0B
16E1:A9 63 20 E6 12 AD 80 1D 93
16E9:F0 04 AE 9D 1D 60 AD 9D A2
16F1:1D 18 6D 9F 1D 29 03 D0 BE
16F9:02 09 01 8D 9D 1D A2 03 0C
1701:A9 40 9D 99 1D CA 10 F8 8E
1709:AE 9D 1D A9 C0 9D 99 1D 01
1711:20 62 16 4C DC 16 20 20 0F
1719:20 52 41 44 53 20 20 20 D3
1721:20 00 4F 4E 45 20 44 52 B3
1729:4F 49 44 20 20 00 44 52 B7
1731:4F 49 44 20 54 45 41 4D 6B
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1741:49 54 49 4F 4E FF 47 41 89
1749:4D 45 20 4F 56 45 52 00 D4
1751:43 4F 4E 54 49 4E 55 45 77
1759:20 00 52 45 53 54 41 52 F6
1761:54 20 20 00 51 55 49 54 8C
1769:20 20 20 20 20 FF 93 11 EE
1771:20 20 20 20 2A 31 39 38 7E

1779:38 20 43 4F 4D 50 55 54 D3
1781:45 20 50 55 42 4C 49 43 D2
1789:41 54 49 4F 4E 53 2C 20 C3
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1799:20 20 20 20 20 20 20 20 C7
17A1:41 4C 4C 20 52 49 47 48 9D
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17B1:56 45 44 2E 00 01 02 04 D3
17B9:08 10 20 40 80 FE FD FB EF
17C1:F7 EF DF BF 7F 16 30 0C A0
17C9:0C 30 0C 30 0C 30 3C CC F4
17D1:33 3C 3C 33 CC C3 FC 3F 12
17D9:CF F3 FC 3F CF F3 00 3C 0B
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17E9:99 A1 A1 99 42 3C 08 12 40
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17F9:03 34 38 34 01 03 07 00 23
1801:07 10 1B 28 37 48 5B 70 A0
1809:06 07 11 0A 1E 07 00 11 DE
1811:07 02 0C 22 0C 11 0F 00 AB
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1821:1A 10 00 0C 04 18 04 04 AF
1829:08 20 08 0E 11 16 11 00 4A
1831:0C 04 11 04 16 04 19 07 C4
1839:15 0A 11 0D 0D 10 00 12 24
1841:04 0D 07 17 07 0F 0A 15 A6
1849:0A 0D 0D 17 0D 12 10 00 A5
1851:03 0B 06 0C 09 0D 0C 0E E9
1859:12 0F 18 0E 1B 0D 1E 0C 8F
1861:21 0B 00 04 0E 04 10 07 CC
1869:0D 0A 0E 0A 10 19 0E 19 1F
1871:10 1C 0D 1F 0E 1F 10 00 51
1879:0B 0A 0B 0C 0B 0E 0F 0A 8C
1881:0F 0C 0F 0E 13 0A 13 0C F1
1889:13 0E 17 0A 17 0C 17 0E 6F
1891:00 FA 04 08 F9 08 F9 28 8D
1899:00 02 AA 80 0A AA A0 05 E8
18A1:55 50 05 55 50 05 FD 50 69
18A9:05 55 50 05 55 50 0A AA B6
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18B9:FA 18 08 F9 08 F9 28 00 86
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18E9:F9 7C F9 38 FA 2D 54 F9 28
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18F9:F9 B9 F9 44 FA 2D 08 F9 AF
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1909:00 01 B9 F9 44 00 00 AA 1F
1911:FA 2A 0B F9 A4 00 01 44 B7
1919:F9 3A C0 02 FD 00 01 38 39
1921:00 02 25 80 00 C6 F9 29 B8
1929:FA 27 18 F9 A3 00 01 54 B8
1931:F9 3B 00 01 FC F9 3A F9 7D
1939:E9 F9 24 FA 27 10 F9 94 15
1941:F9 48 80 02 C5 00 05 3A 25
1949:F9 7D 80 06 B8 40 01 45 56
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1959:1B 44 F9 24 80 02 C9 00 4B
1961:01 46 00 06 48 C0 01 1D 6A
1969:10 0C FE E0 03 3E 00 02 A7
1971:5D 80 05 C2 70 01 22 40 4B
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1999:12 3E F9 5D 60 0B 48 90 C9
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1A09:01 04 FA 0D 4C FA 16 38 A1
1A11:F9 44 F9 AA F9 92 F9 44 8F
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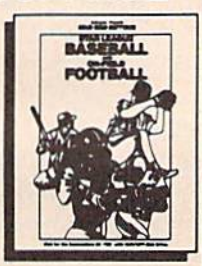

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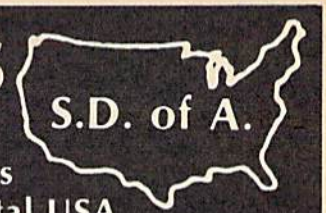

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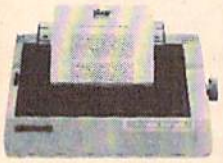

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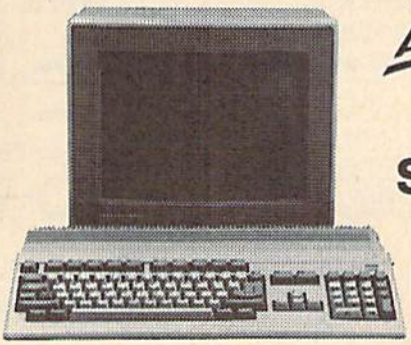

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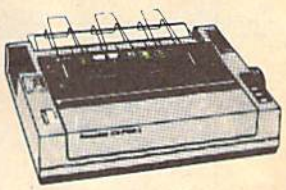

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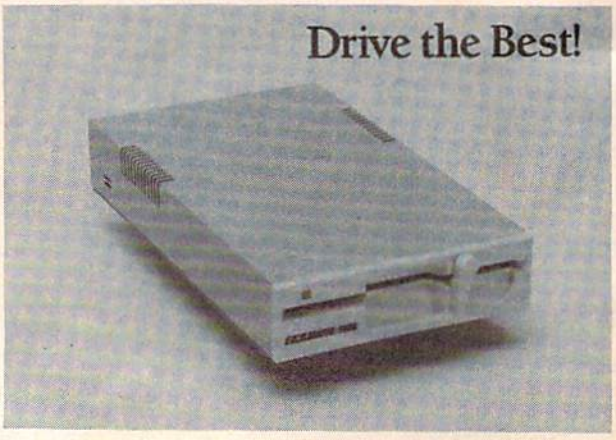

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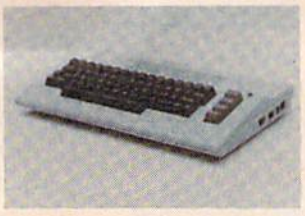

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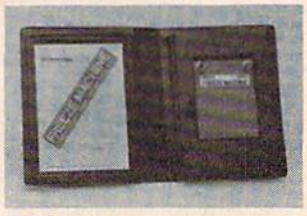

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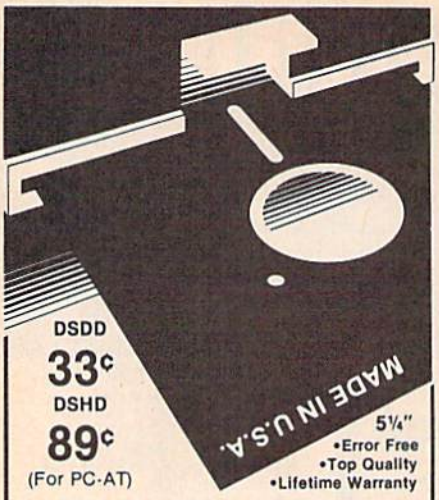

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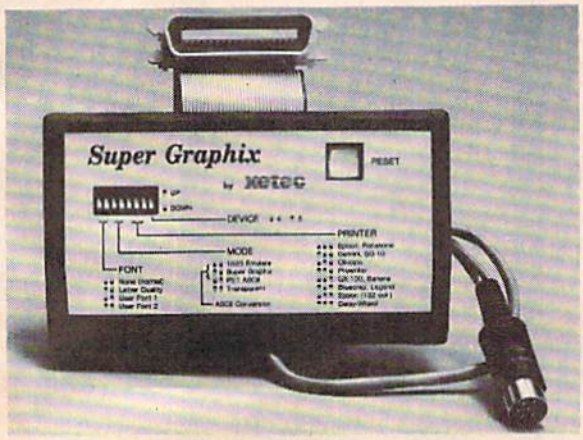

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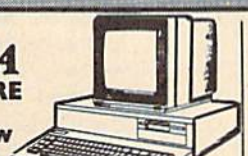

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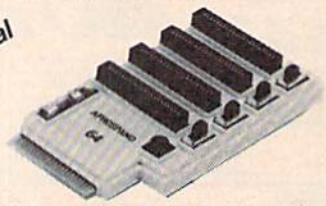

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How To Type In *COMPUTE!'s Gazette* Programs

Each month, COMPUTE!'s Gazette publishes programs for the Commodore 128, 64, Plus/4, and 16. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We frequently publish two programs designed to make typing easier: The Automatic Proofreader, and MLX, designed for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off then on, erasing what was in memory. So be sure to *save a program before you run it.* If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from the GAZETTE, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight SHIFTed A's).

If a key is enclosed in special brackets, [ ], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT}, and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is *the quote mode.*

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a reverse video character (a graphics symbol for cursor left). In this case, you can use the DELete key to back up and edit the line. Type another quote and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it.

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT + ←CRSR→	
{RIGHT}	←CRSR→	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	

When You Read:	Press:	See:
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	
{ F1 }	f1	
{ F2 }	SHIFT + f1	
{ F3 }	f3	
{ F4 }	SHIFT + f3	
{ F5 }	f5	
{ F6 }	SHIFT + f5	
{ F7 }	f7	
{ F8 }	SHIFT + f7	

When You Read:	Press:	See:
←	←	
SHIFT + ↑	SHIFT + ↑	

For Commodore 64 Only

[1]	COMMODORE + 1	
[2]	COMMODORE + 2	
[3]	COMMODORE + 3	
[4]	COMMODORE + 4	
[5]	COMMODORE + 5	
[6]	COMMODORE + 6	
[7]	COMMODORE + 7	
[8]	COMMODORE + 8	

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The Automatic Proofreader

Philip I. Nelson

"The Automatic Proofreader" helps you type in program listings for the 128, 64, Plus/4, and 16 and prevents nearly every kind of typing mistake.

Type in the Proofreader *exactly* as listed. Since the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unfamiliar commands. After finishing, save a copy or two on disk or tape before running it. This is important because the Proofreader erases the BASIC portion of itself when you run it, leaving only the machine language portion in memory.

Next, type RUN and press RETURN. After announcing which computer it's running on, the Proofreader displays the message "Proofreader Active". Now you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the Proofreader displays a two-letter checksum in the upper-left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If the letters don't match, check for your mistake and correct the line.

The Proofreader ignores spaces not enclosed in quotes, so you can omit or add spaces between keywords and still see a matching checksum. However, since spaces inside quotes are almost always significant, the Proofreader pays attention to them. For example, **10 PRINT"THIS IS BASIC"** will generate a different checksum than **10 PRINT"THIS ISBA SIC"**.

A common typing error is transposition—typing two successive characters in the wrong order, like PIRNT instead of PRINT or 64378 instead of 64738. The Proofreader is sensitive to the *position* of each character within the line and thus catches transposition errors.

The Proofreader does *not* accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTing it after typing it in, moving the cursor back to the line, and pressing RETURN. LISTing the line substitutes the full keyword for the abbreviation and allows the Proofreader to work properly. The same technique works for rechecking programs you've already typed in.

If you're using the Proofreader on the Commodore 128, Plus/4, or 16, *do not perform any GRAPHIC commands while the Proofreader is active.* When you perform a command like GRAPHIC 1, the computer moves everything at the start of BASIC program space—including the Proofreader—to another memory area, causing the Proofreader to crash. The same thing happens if you *run* any program with a GRAPHIC command while the Proofreader is in memory.

Though the Proofreader doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. However, the Proofreader is purposely difficult to dislodge: It's not affected by tape or disk operations, or by pressing RUN/STOP–RESTORE. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (SYS 65341 for the 128, 64738 for the 64, and 65526 for the Plus/4 and 16). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

If you own a Commodore 64, you may already have wondered whether the Proofreader works with other programming utilities like "MetaBASIC." The answer is generally yes, *if you're using a 64 and activate the Proofreader after installing the other utility.* For example, first load and activate MetaBASIC, then load and run the Proofreader.

When using the Proofreader with another utility, you should disable *both* programs before running a BASIC program. While the Proofreader seems unaffected by most utilities, there's no way to promise that it will work with any and every combination of utilities you might want to use. The more utilities activated, the more fragile the system becomes.

The New Automatic Proofreader

```
10 VEC=PEEK(772)+256*PEEK(773)
   :LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADE
   R FOR ";:IF VEC=42364 THEN
   {SPACE}PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI
   C-20"
40 IF VEC=35158 THEN GRAPHIC C
   LR:PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=
   46:GRAPHIC CLR:PRINT"128"
60 SA=(PEEK(LO)+256*PEEK(HI))+
   6:ADR=SA
70 FOR J=0 TO 166:READ BYT:POK
   E ADR,BYT:ADR=ADR+1:CHK=CHK
   +BYT:NEXT
80 IF CHK<>20570 THEN PRINT "*
   ERROR* CHECK TYPING IN DATA
    STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:
   RS=SA+RF:HB=INT(RS/256):LB=
   RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+L
   F,LB:POKE SA+HF,HB:NEXT
110 IF CHK<>22054 THEN PRINT "
   *ERROR* RELOAD PROGRAM AND
   {SPACE}CHECK FINAL LINE":EN
   D
120 POKE SA+149,PEEK(772):POKE
    SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+
   14,22:POKE SA+18,23:POKESA+
   29,224:POKESA+139,224
140 PRINT CHR$(147);CHR$(17);"
   PROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (P
   EEK(LO)+256*PEEK(HI))-1,0:N
   EW
160 DATA 120,169,73,141,4,3,16
   9,3,141,5,3
170 DATA 88,96,165,20,133,167,
   165,21,133,168,169
180 DATA 0,141,0,255,162,31,18
   1,199,157,227,3
190 DATA 202,16,248,169,19,32,
   210,255,169,18,32
200 DATA 210,255,160,0,132,180
   ,132,176,136,230,180
210 DATA 200,185,0,2,240,46,20
   1,34,208,8,72
220 DATA 165,176,73,255,133,17
   6,104,72,201,32,208
230 DATA 7,165,176,208,3,104,2
   08,226,104,166,180
240 DATA 24,165,167,121,0,2,13
   3,167,165,168,105
250 DATA 0,133,168,202,208,239
   ,240,202,165,167,69
260 DATA 168,72,41,15,168,185,
   211,3,32,210,255
270 DATA 104,74,74,74,74,168,1
   85,211,3,32,210
280 DATA 255,162,31,189,227,3,
   149,199,202,16,248
290 DATA 169,146,32,210,255,76
   ,86,137,65,66,67
300 DATA 68,69,70,71,72,74,75,
   77,80,81,82,83,88
310 DATA 13,2,7,167,31,32,151,
   116,117,151,128,129,167,136
   ,137
```

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MLX Machine Language Entry Program For Commodore 64

Ottis Cowper, Technical Editor

"MLX" is a labor-saving utility that allows almost fail-safe entry of Commodore 64 machine language programs.

Type in and save some copies of MLX—you'll want to use it to enter future ML programs from COMPUTE!'s GAZETTE. When you're ready to enter an ML program, load and run MLX. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing.

If you're unfamiliar with machine language, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters A–F. But don't worry—even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is ENTER DATA. If you're just starting to type in a program, pick this. Press the E key, and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you left off typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering A Listing

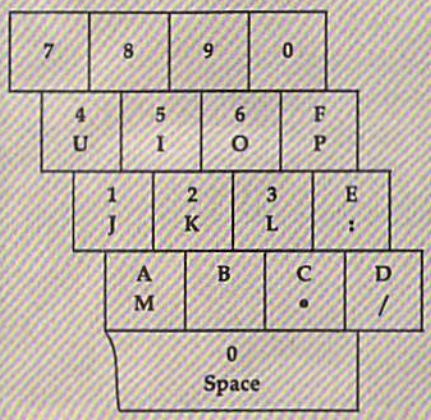
Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLX-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows MLX to check your typing.

When you enter a line, MLX recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if MLX detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You *do not* type spaces between the columns; MLX automatically inserts these for you. You *do not* press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit.

Only the numerals 0–9 and the letters A–F can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, the numeric keypad modification from the March 1986 "Bug-Swatter" column is now incorporated in the listing. The keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figure below shows the keypad configuration:



MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, MLX will catch your mistake. There is one error that can slip past MLX: Because of the checksum formula used, MLX won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line really badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character of data, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line number prompt.

More editing features are available when correcting lines in which MLX has detected an error. To make corrections in a line that MLX has redisplayed for editing, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. The cursor left and right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, DISPLAY DATA, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, MLX asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. MLX displays program lines until it reaches the end of the program, at which point the menu is redis-

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played. You can pause the display by pressing the space bar. (MLX finishes printing the current line before halting.) Press space again to restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are SAVE FILE and LOAD FILE; their operation is quite straightforward. When you press S or L, MLX asks you for the filename. You'll then be asked to press either D or T tc select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save. Don't panic; this is normal behavior. MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands. Disk users should also note that the drive prefix 0: is automatically added to the filename (line 750), so this should *not* be included when entering the name. This also precludes the use of @ for Save-with-Replace, so remember to give each version you save a different name.

Remember that MLX saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. (Tape users should bear in mind that Commodore computers are never able to detect errors during a save to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started MLX. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct starting and ending addresses.

The QUIT menu option has the obvious effect—it stops MLX and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading and using the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD *"filename"*,8 for disk or LOAD *"filename"* for tape, and then RUN. Such programs will usually have a starting address of 0801 for the 64. Other programs must be reloaded to specific addresses with a command such as LOAD *"filename"*,8,1 for disk or LOAD *"filename"*,1,1 for tape, then started with a SYS to a particular memory address. On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000. In either case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

An Ounce Of Prevention

By the time you finish typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type the new MLX, and then test your copy *thoroughly* before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to insure that you can recall your work from disk or tape. Don't let a simple typing error in the new MLX cost you several nights of hard work.

MLX For Commodore 64

```
SS 10 REM VERSION 1.1: LINES 8
      30,950 MODIFIED, LINES 4
      85-487 ADDED
EK 100 POKE 56,50:CLR:DIM IN$,
      I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
      4=254:Z5=255:Z6=256:Z7=
      127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
      :BS=PEEK(55)+Z6*PEEK(56
      ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
      :S$=" ":D$=CHR$(20):Z$=
      CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
      +23:POKE I,0:NEXT:POKE
      {SPACE}SD+24,15:POKE 78
      8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
      R$(8):POKE 53280,15:POK
      E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
      {2 SPACES}{8 @}
      {2 SPACES}"SPC(28)"
      {2 SPACES}{OFF}{BLU} ML
      X II {RED}{RVS}
      {2 SPACES}"SPC(28)"
      {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
      {3 SPACES}COMPUTE!'S MA
      CHINE LANGUAGE EDITOR
      {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
      RESS{4}";:GOSUB300:SA=A
      D:GOSUB1040:IF F THEN18
      0
GF 190 PRINT"{BLK}{2 SPACES}EN
      DING ADDRESS{4}";:GOSUB
      300:EA=AD:GOSUB1030:IF
      {SPACE}F THEN190
KR 200 INPUT"{3 DOWN}{BLK}CLEA
      R WORKSPACE [Y/N]{4}";A
      $:IF LEFT$(A$,1)<>"Y"TH
      EN220
PG 210 PRINT"{2 DOWN}{BLU}WORK
      ING...";:FORI=BS TO BS+
      EA-SA+7:POKE I,0:NEXT:P
      RINT"DONE"
DR 220 PRINTTAB(10)"{2 DOWN}
      {BLK}{RVS} MLX COMMAND
      {SPACE}MENU {DOWN}{4}":
      PRINT T$"{RVS}E{OFF}NTE
      R DATA"
BD 230 PRINT T$"{RVS}D{OFF}ISP
      LAY DATA":PRINT T$"
      {RVS}L{OFF}OAD FILE"
JS 240 PRINT T$"{RVS}S{OFF}AVE
       FILE":PRINT T$"{RVS}Q
      {OFF}UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=
      MID$("EDLSQ",I,1)THEN A
      =I:I=5
FD 270 NEXT:ON A GOTO420,610,6
      90,700,280:GOSUB1060:GO
      TO250
EJ 280 PRINT"{RVS} QUIT ":INPU
      T"{DOWN}{4}ARE YOU SURE
       [Y/N]";A$:IF LEFT$(A$,
      1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IF
      LEN(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$
      =MID$(IN$,3):GOSUB320:A
      D=AD*256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID
      $(B$,J,1):B=ASC(A$)-C4+
      (A$>"@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=
      0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(
      H$,B+1,1);:B=A-B*C6:PRI
      NT MID$(H$,B+1,1);:RETU
      RN
RR 360 A=INT(AD/Z6):GOSUB350:A
      =AD-A*Z6:GOSUB350:PRINT
      ":";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*
      CK+Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
```

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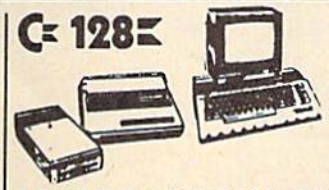

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```
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
       [4]";:GOSUB300:IF IN$<>
       N$ THEN GOSUB1030:IF F
       {SPACE}THEN400
EX 410 RETURN
HD 420 PRINT"{RVS} ENTER DATA
       {SPACE}":GOSUB400:IF IN
       $=N$ THEN220
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F
        THEN PRINT IN$:PRINT"
       {UP}{5 RIGHT}";
GC 450 FOR I=0 TO 24 STEP 3:B$
       =S$:FOR J=1 TO 2:IF F T
       HEN B$=MID$(IN$,I+J,1)
HA 460 PRINT"{RVS}"B$L$;:IF I<
       24THEN PRINT"{OFF}";
HD 470 GET A$:IF A$=N$ THEN470
FK 480 IF(A$>"/"ANDA$<":")OR(A
       $>"@"ANDA$<"G")THEN540
GS 485 A=-(A$="M")-2*(A$=",")-
       3*(A$=".")-4*(A$="/")-5
       *(A$="J")-6*(A$="K")
FX 486 A=A-7*(A$="L")-8*(A$=":
       ")-9*(A$="U")-10*(A$="I
       ")-11*(A$="O")-12*(A$="
       P")
CM 487 A=A-13*(A$=S$):IF A THE
       N A$=MID$("ABCD123E456F
       0",A,1):GOTO 540
MP 490 IF A$=R$ AND((I=0)AND(J
       =1)OR F)THEN PRINT B$;:
       J=2:NEXT:I=24:GOTO550
KC 500 IF A$="{HOME}" THEN PRI
       NT B$:J=2:NEXT:I=24:NEX
       T:F=0:GOTO440
MX 510 IF(A$="{RIGHT}")ANDF TH
       ENPRINT B$L$;:GOTO540
GK 520 IF A$<>L$ AND A$<>D$ OR
       ((I=0)AND(J=1))THEN GOS
       UB1060:GOTO470
HG 530 A$=L$+S$+L$:PRINT B$L$;
       :J=2-J:IF J THEN PRINT
       {SPACE}L$;:I=I-3
QS 540 PRINT A$;:NEXT J:PRINT
       {SPACE}S$;
PM 550 NEXT I:PRINT:PRINT"{UP}
       {5 RIGHT}";:INPUT#3,IN$
       :IF IN$=N$ THEN CLOSE3:
       GOTO220
QC 560 FOR I=1 TO 25 STEP3:B$=
       MID$(IN$,I):GOSUB320:IF
        I<25 THEN GOSUB380:A(I
       /3)=A
PK 570 NEXT:IF A<>CK THEN GOSU
       B1060:PRINT"{BLK}{RVS}
       {SPACE}ERROR: REENTER L
       INE [4]":F=1:GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FO
       R I=0 TO 7:POKE B+I,A(I
       ):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
       LOSE3:PRINT"{DOWN}{BLU}
       ** END OF ENTRY **{BLK}
       {2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT"{CLR}{DOWN}{RVS}
       {SPACE}DISPLAY DATA ":G
       OSUB400:IF IN$=N$ THEN2
       20
RJ 620 PRINT"{DOWN}{BLU}PRESS:
        {RVS}SPACE{OFF} TO PAU
       SE, {RVS}RETURN{OFF} TO
        BREAK[4]{DOWN}"
KS 630 GOSUB360:B=BS+AD-SA:FOR
       I=BTO B+7:A=PEEK(I):GOS
       UB350:GOSUB380:PRINT S$
       ;
CC 640 NEXT:PRINT"{RVS}";:A=CK
       :GOSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA TH
       ENPRINT"{DOWN}{BLU}** E
       ND OF DATA **":GOTO220
KC 660 GET A$:IF A$=R$ THEN GO
       SUB1080:GOTO220
EQ 670 IF A$=S$ THEN F=F+1:GOS
       UB1080
AD 680 ONFGOTO630,660,630
CM 690 PRINT"{DOWN}{RVS} LOAD
       {SPACE}DATA ":OP=1:GOTO
       710
PC 700 PRINT"{DOWN}{RVS} SAVE
       {SPACE}FILE ":OP=0
RX 710 IN$=N$:INPUT"{DOWN}FILE
       NAME[4]";IN$:IF IN$=N$
       {SPACE}THEN220
PR 720 F=0:PRINT"{DOWN}{BLK}
       {RVS}T{OFF}APE OR {RVS}
       D{OFF}ISK: [4]";
FP 730 GET A$:IF A$="T"THEN PR
       INT"T{DOWN}":GOTO880
HQ 740 IF A$<>"D"THEN730
HH 750 PRINT"D{DOWN}":OPEN15,8
       ,15,"I0:":B=EA-SA:IN$="
       0:"+IN$:IF OP THEN810
SQ 760 OPEN 1,8,8,IN$+",P,W":G
       OSUB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(A
       H*256):PRINT#1,CHR$(AL)
       ;CHR$(AH);
PE 780 FOR I=0 TO B:PRINT#1,CH
       R$(PEEK(BS+I));:IF ST T
       HEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
       O940
GS 800 GOSUB1060:PRINT"{DOWN}
       {BLK}ERROR DURING SAVE:
       [4]":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",P,R":G
       OSUB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z
       $)+256*ASC(B$+Z$):IF AD
       <>SA THEN F=1:GOTO850
RX 830 FOR I=0 TO B:GET#1,A$:P
       OKE BS+I,ASC(A$+Z$):IF(
       I<>B)AND ST THEN F=2:AD
       =I:I=B
FA 840 NEXT:IF ST<>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F
       >0)+1 GOTO960,970
SA 860 INPUT#15,A,A$:IF A THEN
        CLOSE1:CLOSE15:GOSUB10
       60:PRINT"{RVS}ERROR: "A
       $
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE
       187,PEEK(FA+3):POKE188,
       PEEK(FA+4):IFOP=0THEN92
       0
HJ 890 SYS 63466:IF(PEEK(783)A
       ND1)THEN GOSUB1060:PRIN
       T"{DOWN}{RVS} FILE NOT
       {SPACE}FOUND ":GOTO690
CS 900 AD=PEEK(829)+256*PEEK(8
       30):IF AD<>SA THEN F=1:
       GOTO970
SC 910 A=PEEK(831)+256*PEEK(83
       2)-1:F=F-2*(A<EA)-3*(A>
       EA):AD=A-AD:GOTO930
KM 920 A=SA:B=EA+1:GOSUB1010:P
       OKE780,3:SYS 63338
JF 930 A=BS:B=BS+(EA-SA)+1:GOS
       UB1010:ON OP GOTO950:SY
       S 63591
AE 940 GOSUB1080:PRINT"{BLU}**
        SAVE COMPLETED **":GOT
       O220
XP 950 POKE147,0:SYS 63562:IF
       {SPACE}ST>0 THEN970
FR 960 GOSUB1080:PRINT"{BLU}**
        LOAD COMPLETED **":GOT
       O220
DP 970 GOSUB1060:PRINT"{BLK}
       {RVS}ERROR DURING LOAD:
       {DOWN}[4]":ON F GOSUB98
       0,990,1000:GOTO220
PP 980 PRINT"INCORRECT STARTIN
       G ADDRESS (";:GOSUB360:
       PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT ";:
       AD=SA+AD:GOSUB360:PRINT
       D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
       ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
       *256):POKE193,AL:POKE1
       94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
       *256):POKE174,AL:POKE1
       75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
       1050
HA 1040 IF(AD>511 AND AD<40960
       )OR(AD>49151 AND AD<53
       248)THEN GOSUB1080:F=0
       :RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
       {SPACE}INVALID ADDRESS
        {DOWN}{BLK}":F=1:RETU
       RN
AR 1060 POKE SD+5,31:POKE SD+6
       ,208:POKE SD,240:POKE
       {SPACE}SD+1,4:POKE SD+
       4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
       TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
       240:POKE SD,0:POKE SD+
       1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
       KE SD+4,0:POKE SD,0:PO
       KE SD+1,0:RETURN
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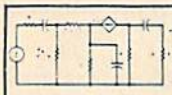

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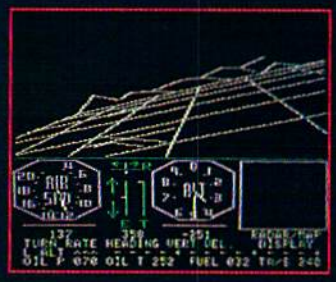
1987 - Expanding Scenery disk coverage; East Coast, Japan, & Europe

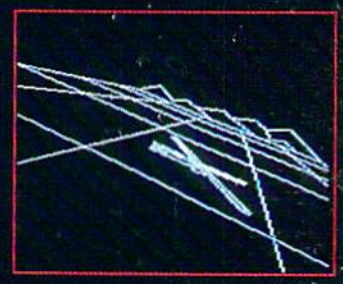
1986 - Flight Simulator II for the 68000 computers

1985 - High-performance Jet flight simulator for the IBM, Commodore 64, and Apple II computers

1982/1983 - Microsoft Flight Simulator & Flight Simulator II



1979 - 3D graphics applied to the original FS1 Flight Simulator for the new Apple II and TRS-80 computers



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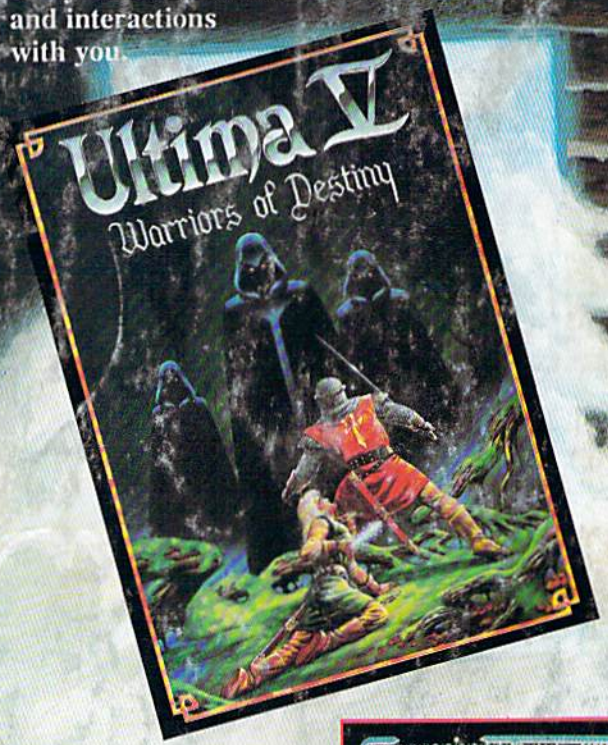
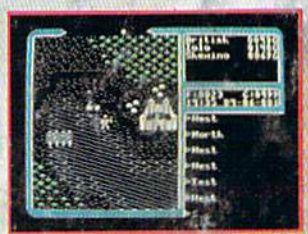
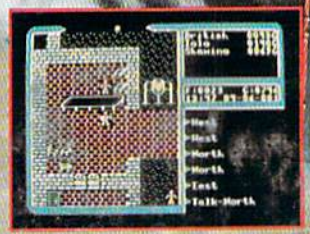
- Hundreds of truly life-like people who can carry on complex conversations and interactions with you.







Screen displays shown from the Apple™. Others may vary. Allows the use of Ultima IV characters. No previous Ultima experience required.

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